Gas Journal, April 27, 1921. Registered as a Newspaper.

MAY 16 1921 CHEMICAL LIBRARY

MAY 18 1921

GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

Vol. CLIV. No. 3024.] LONDON, APRIL 27, 1921. [73rd Year. Price 1s.

OXIDE OF IRON
SPENT OXIDE

GAS PURIFICATION AND CHEMICAL CO., Ltd.
PALMERSTON HOUSE, LONDON, E.C.2.
Telegrams: "PURIFICATION, LONDON."
Telephone: 9144 London Wall.

Aluminium
RESISTS SULPHUR FUMES.
WRITE FOR .. GAS LEAFLET
THE BRITISH ALUMINIUM CO., LTD.,
109, Queen Victoria Street, London.

R. & W. HAWTHORN LESLIE & CO., LTD.
In Stock.
TANK LOCOMOTIVES
Always In Progress.
Locomotive & Marine Engineers & Shipbuilders,
NEWCASTLE-ON-TYNE.

INTERMITTENT VERTICALS.
Adopted all over the World.
Vertical Gas Retort Syndicate LTD.
17, VICTORIA ST., WESTMINSTER, S.W.
Sole Agents for Australasia
JAMES HURLL & CO., LTD., SYDNEY.

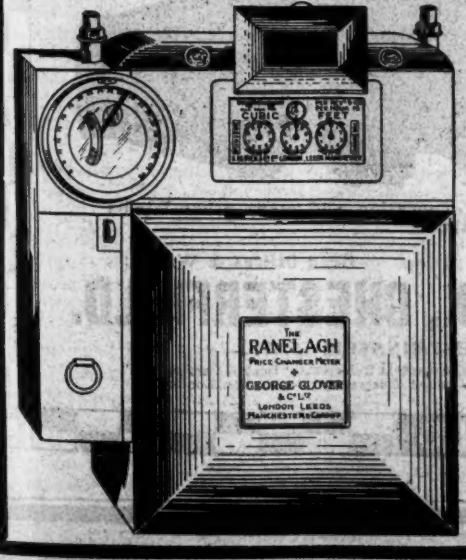
TORBAY STOVE BLACK
FOR GAS COOKERS.
The TORBAY PAINT CO.,
26/28, Billiter St., LONDON, E.C.
39/41, Old Hall St., LIVERPOOL.

GAS & CANNEL COAL CONTRACTORS.
WM. F. RUSSELL & SONS.
Telegrams for all Offices: "MONKLAND."
GLASGOW: 90, Mitchell Street;
NEWCASTLE: Exchange Buildings;
HULL: Exchange Buildings, Lowgate;
LIVERPOOL: 5, Castle St.; &
SWANSEA: Atlantic Buildings.

JAMES McKELVIE & CO.
Coal Owners,
Gas and Steam Coal Contractors,
17, RUTLAND SQUARE, EDINBURGH.
59, MARK LANE, LONDON, E.C.
GUILDHALL CHAMBERS, SANDHILL, NEWCASTLE-ON-TYNE.
24, CHAPEL STREET, LIVERPOOL.
ESTABLISHED 1840.

W. PARKINSON & CO.
(Incorporated in Parkinson and W. & B. Cowan, Ltd.),
LONDON & BIRMINGHAM.
(See Advertisement p. 192).

STEWARTS AND LLOYDS, LIMITED, 41, OSWALD STREET, GLASGOW. BROAD STREET CHAMBERS, BIRMINGHAM.
TUBES & FITTINGS for Gas, Steam, Water, &c.



George Glover's New
"Ranelagh"
Price-changer Pre-payment Gas Meter.
The simple price changing disc has a range of from 5 to 47 feet in the penny meter or 60 to 564 in the shilling type.
GEORGE GLOVER & CO., LTD.
Ranelagh Works, Royal Avenue, Chelsea, London, S.W. 3.
Branches: 9, Dewsbury Rd., Leeds, & Gaythorn Meter Works, Manchester.

"FERRODOR" ELASTIC PAINT
FOR ALL GAS PLANT AND STEEL STRUCTURES.
Does not blister or "chalk" off.
GRIFFITHS BROS. & CO. (LONDON), LTD.
HAMMERSMITH, LONDON, W.6.

J. & J. BRADDOCK

(Branch of Meters Limited),

GLOBE METER WORKS,

Telegrams: "Braddock, Oldham." Telephone 815.

OLDHAM,

AND

45 & 47, WESTMINSTER BRIDGE ROAD,

Telegrams: "Metriqua, Lamb London." Telephone 2412 Hop.

LONDON, S.E. 1.

MANUFACTURERS OF HIGH-CLASS

GAS STATION METERS.

BRADDOCK'S

STATION GOVERNORS

AND

RETORT-HOUSE GOVERNORS.

IMPROVED

WET & DRY GAS METERS

OF BEST QUALITY.

BRADDOCK'S PATENT

"SLOT" METERS.

FULL PARTICULARS ON APPLICATION.

TELEGRAMS "SEAWARD, HULL." TELEPHONE: 5571 CENTRAL.

ARTHUR WHARTON & CO.

EXPORTERS OF

GAS, FURNACE & FOUNDRY

COKE, COAL TAR & PITCH.

HULL.

THE GLENBOIG UNION FIRE-CLAY Co. Ltd.

WORKS: Glenboig, Lanarkshire.

OFFICES: 48, WEST REGENT ST., GLASGOW.

GAS-RETORTS, HORIZONTAL, INCLINED, and VERTICAL, to New Standard Specification.

58 FIRST AWARDS At International and Home Exhibitions, including Grand Prize at Brussels, 1910.

To every case the highest award given for Fire Clay Goods.

The Glenboig Bricks, Blocks, and Retorts combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

B DONKIN D

A TIGHT GAS VALVE FOR HIGH-PRESSURE MAINS.

DOUBLE FACED GAS VALVES

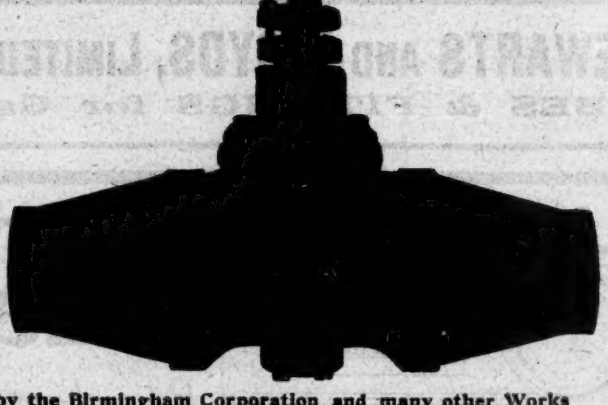
(PATENT NO. 12734/06).

SPECIALLY SUITABLE FOR HIGH PRESSURE GAS.

We have specially designed these valves for use in connection with high-pressure gas, either with screwed ends, flanged ends, or with separate sockets for Mannesmann Steel Tube Rigid Joint. They have all the advantages of the rack and pinion or worm and rack valve—that is to say, they have the scraping action of the doors over the faces, as the two faces are separate and kept out to their work by springs, so that they will not have the disadvantage of the usual double faced solid body type valve which tends to jamb after it has been at work some time.

Very much thought and care have been given to the design of these valves and very rigid air tests have been made upon them for tightness.

PRICES ON APPLICATION.



This type of Valve has been adopted by the Birmingham Corporation and many other Works for their High-Pressure Mains.

LARGE NUMBERS SUPPLIED.

Head Offices & Works:

THE BRYAN DONKIN CO., LTD., CHESTERFIELD.

London Office: 3, VICTORIA STREET, WESTMINSTER, S.W. 1.

Chesterfield Telephone No. 84. London Telephone No. 5888 Victoria.

Chesterfield Telegrams, "Donkin Chesterfield." London Telegrams, "Donkin Vic. London."

B CHESTERFIELD D

GAS JOURNAL

LIGHT ✂ HEAT ✂ POWER ✂ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

VOL. CLIV., No. 3024.] WEDNESDAY, APRIL 27, 1921. [73RD YEAR.

EDITORIAL NOTES.

So Far Irreconcilable.

THE coal strike dragged on wearily last week; and at the moment it looks as though the struggle is going to be a very protracted one. The greater its length, the more serious it becomes for the country. Three-and-a-half weeks have passed now since work ceased at the pits; and the chasm between the parties in respect of a mutual settlement on a reasonable basis (what we all desire) is still wide and deep. Industries are suffering severely, unemployment is becoming more widespread and acute, and coal stocks are running down—every day more so. A few shiploads of American coal that may reach these shores in a few days will be but a drop in the ocean of requirement; and the railway and transport workers are now refusing to handle coal. The voting that took place among the miners last week went strongly in favour of holding-out for the original claims, chief among which is the national pool, though some of the districts were in favour of the re-opening of negotiations, with the view of a temporary agreement while maintaining the questions of a national board and a national pool as essentials to a permanent settlement. If agreement cannot be reached, it means that the fight will have to proceed to exhaustion; and exhaustion means (irrespective of the incalculable losses to the country) the draining by the miners of all their financial resources. The Unions are in low water now in respect of liquid funds; in some cases the internal "pool" has already "dried up." There is a proposal on board now that there shall be a voluntary levy on all members of the unions affiliated to the Trade Union Congress, in order that a settlement may not be forced on the miners by lack of funds. But this sort of thing—voluntary and not obligatory—would not be tolerated, if started, for any length of time by workers who are hard hit by this struggle, and among whom employment is fast diminishing.

The end of the week was the most critical part. But before dealing with what happened, when the miners' delegates returned from their sojourn in the coal areas with their instructions, there are a few points which should be made in order to show the first aspects of the new situation which had been brought into being by the retirement of the railway and transport branches of the Triple Alliance from participation in the conflict. This retirement once more limited the position to discussion and negotiation with the Miners' Federation; but naturally the whole of the ground was littered with obstacles of a somewhat formidable character. The Secretary of the Miners' Federation (Mr. Frank Hodges) was, at the opening of the week, a man much abused by the extremist leaders, and by many men of the rank-and-file in the coal centres where strong views are most frequently heard, but where the voices of the moderate men (of whom there are a great number even in those areas) are generally silent. However, the moderates in the labour world were rallying round Mr. Hodges, with the view of obtaining a temporary settlement to give time to discuss the larger issues. He did not by any means find himself friendless. In the political world at the same time, it was felt that the new position might give a better opportunity for arriving at, not a temporary settlement, but a permanent one. This was a great and rather exalted expectation. From the districts in which one naturally looks for the strongest lunged extremists, there at once came (in the hour of anger over the split that had taken place in the Triple Alliance) demands for a fast adhesion to the original claims; and from few of the areas there issued instructions to go forward with the suggestion for a new conference. However, there was wisdom in this view, for more can be accomplished round a table than by any other means. Simultaneously, there was also much criticism over the week's delay, owing to the Miners' Federation fixing Friday for the national conference of delegates. But there is excellent defence. It must be remembered that the Executive of the Federation were governed in their action by the decision of the previous delegate conference that any agreement should be based on a national board and a national pool. The Executive had no authority to accept any other conditions. Consultation in the coal areas was therefore necessary. Breathing time was further essential; and so was time for the ebullitions of anger to simmer-down. It was also necessary that in the mining districts it should be made well known that the Government, the owners, and the community generally were definitely opposed to a national pooling of profits being permanently attached to the coal industry.

The air appeared to be cleared considerably in the House of Commons on Monday during a discussion on recruiting, which by that time was already being stopped. The clearing of the air was due to the very tactful way in which Mr. Vernon Hartshorn and the Prime Minister discussed points relating to the suggestions that the Government had made during the preceding week. What, asked Mr. Hartshorn, did the Government mean by a National Wages Board? The Prime Minister declined to define it in exact terms; but he went so far as to indicate what the Government had in mind, which was that the principles on which wages should be based in all areas must be settled nationally, and the scheme must be one that would give the miners a real interest in the prosperity of the industry. Reasonable men would count this for much; but not so the coal extremists. Another point was as to the ratio of profits and wages; and upon this Mr. Hartshorn intimated that the Miners' Federation were willing to submit the matter to the arbitration of competent persons, if the miners and the owners could not settle it between themselves. But the critical question is as to the national pool. The Government says it inevitably means the restoration of control; and, as the Premier puts it, control confers power to meddle without the power to manage. But even the pool question changed its complexion. The first claim was a pool of profits; then came the suggestion for a pool formed by a levy on tonnage. When, however, it is learned that output in Yorkshire has fallen 17 p.ct. and in South Wales by 48 p.ct. compared with pre-war figures, this carries with it an argument which the miners in the more productive districts, if they were wise, would see for themselves is an inherent obstacle to a national pool formed and maintained by a levy on tonnage. Moreover, a flat-rate levy per ton would be unfair on the different grades of coal. The proposal the mine owners described as unequal and unjust. Certain it is that a levy on tonnage would mean that the consumers would again have to pay; and yet it is the present high price of coal that has helped to bring the coal industry to its present deplorable position. Fresh suggestions were made by the coal owners; but these were also rejected as "vague and meaningless" by the Miners' Federation. As to wages, there were severe criticisms during the week of the lower rates in the owners' proposed scale. But they assert that they have gone to the utmost limits, if the industry is to be re-established on a paying basis. So Friday dawned with an *impasse* in the coal world that appeared to be impregnable.

However, it was something to the good to find on Friday the miners' representatives were willing to meet the coal owners in the afternoon at the conference at the Board of Trade, to which they had been invited by the Premier; but both at the delegates' meeting and at the later conference, there was reaffirmation of the intention not to accept any

agreement that did not contain the principles of a pool—a pool provided by a tonnage levy on those collieries the income of which is more than sufficient to meet the cost of production. At the same time, the miners made it known that they were willing to make a flat-rate reduction of 2s. per ton in the present wages of all classes of workers as their contribution to the reconstruction of the industry on a paying basis. There is vagueness in the pooling suggestion as it at present stands; but the parties are now again face to face, and the pool question will be discussed as a feature of the wages problem. There is, however, no denying that a pool would be an uneconomic attachment to the coal industry, and could not be permanently countenanced. But it was something to get the parties together once again, though there was disappointment at the outset owing to the fact that, while the miners' representatives were in a position to state their case, the mine owners were not then ready to present an amended offer in respect of wages to eliminate the low levels in the scale against which so much criticism has been levelled. Is there no way in which the miners themselves could help to reduce the cost of production, and so increase the ability to pay better wages than is possible now? Cannot they realize that the standard of production of 1913 shows that there are now too many persons at work having regard to the output? The average daily output in 1913 per person employed was a little over 1 ton; it is now about ¾ ton. With a smaller number of men in 1913, 287 million tons of coal were produced, compared with 230 million tons in the past year. Rectification of the position in regard to wages is not altogether a matter for the owners; the miners are a potential factor in the situation. However, we hope that the present conference will be governed by sane and practical thinking, and that it will issue in peace.

To Secure Economy in Local Expenditure.

Throughout the country there has been considerable agitation respecting the alarming flight of the amount levied for rates; and everywhere there is complaint by private householders as well as by the heads of considerable manufacturing and business establishments. In the Chambers of Commerce throughout the country, the question is being discussed by the members, who, being manufacturers and traders, know well the extent of the burden that rates have become on industrial and commercial prosperity. In the House of Lords and the House of Commons, the question has of late been very frequently referred to; and not long since, it will be remembered, there was issued the recommendations of the Select Committee on the Procedure Governing Bills which Involve Charges upon the Rates.* This shows the widespread feeling there is regarding the matter. Little can now be done to bring about any reduction of the obligations that have already been incurred through large expenditure; and the only means of retrenching in other directions is by carrying on necessary work as economically as is possible. But the lessons of the past few years have suggested that there must be by some means greater control than there is at the present time over new local expenditure. The recommendations of the Select Committee previously referred to do not give much guidance as to the course that should be pursued, and, as a matter of fact, their suggestions can be but moderately effective.

However, those who are desirous of securing that there shall be greater control over local expenditure intend pushing forward with the matter as far as possible. We see this in two or three directions—directions which have a powerful influence in shaping public opinion. In Chambers of Commerce away North, there is an almost unanimous view that the electricity generating and transmission developments which are at present being considered by the Electricity Commissioners under the Electricity Supply Act of 1919 should be carried out by private enterprise, and not by joint bodies of local authorities, to whom it is proposed, by the Electricity Supply (No. 2) Bill, which has lately been introduced, to give power to raise and lend money for the capital purposes of the joint authority. It is very widely feared that this liberty of action in subscribing money to an outside body in which the subscribing authority will have only a voice and not complete control, may result in a heavy call upon the rates to meet any deficiency of the *quasi*-public body. It is an extension of municipal adventure which will invite very keen opposition before, if ever, the empowering measure passes the Legislature.

Then, again, we see there has been introduced in the House by a private member a measure entitled the Local Rates (Increase Prevention) Bill, which is down for second reading on April 29. This Bill, it appears, has been drafted by the London Municipal Society, which body describes it as an important attempt "to stem the tide of rising rates." We hope it will succeed. The manner in which the attempt is being made takes various forms and directions. In the first place, it is contemplated that each local authority shall appoint a statutory finance committee for regulating and controlling the finances of the authority. In the case of county councils and metropolitan borough councils under the Local Government Act of 1888 and the London Government Act of 1899, such committees already exist; but no other authority is compelled by statute to appoint a committee of the kind. The statutory finance committee is intended to be a barrier against the overwhelming tendency of the spending committees of a local authority to embark on all sorts of schemes regardless of the total result upon the rates. The Bill defines the duties and powers of such committees. It is the general view that the first practical step towards securing economy in local government is to set up stronger financial control within the local authorities themselves. For this the Bill provides as mentioned.

It is next proposed that there shall be a transfer from the Ministry of Health to the Treasury of all powers relating to property and loans of local authorities. When one comes to think over the matter, and the causes which have given rise to this suggestion as to the transfer of powers, it is very clear that a fairly strong case can be made out in its favour. The Ministry of Health, as the London Municipal Society points out, has become a great spending body itself. It issues orders of a compulsory nature upon local authorities to carry-out schemes to the satisfaction of the Minister of Health. This has been the trend of modern legislation dealing with local affairs. The costly schemes which are the result of the proposals of the Ministry are prepared and then presented to the Ministry for approval; and naturally this is accorded. Sanction to borrow the money for the purpose is sought; and is it likely, in present circumstances, that it is ever refused for these specific objects? This, to say the least, is a singular position, because, as the Society submit, the Ministry cannot impartially exercise their functions of loan control when the money is to be applied to schemes promoted by the Ministry themselves.

It is next found that the Bill intends that the finance committee of the local authority shall send to the county council, before March 1 each year, a copy of the estimate of expenditure and receipts of the local authority, together with the capital accounts for the succeeding year, with a statement of actual and estimated expenditure for the current year. Similarly, it is proposed that a statement shall be submitted as to the amount of loans outstanding and loans proposed to be raised in the following year. Certain obligations in regard to the preparation of a combined statement, it is intended, shall be placed upon the finance committee of the county council, who will not only submit this to every local authority in the county, but copies are to be forwarded to the Treasury. This (if the Bill passes) will enable the Treasury to present to the House of Commons a statement of local government expenditure for the ensuing year at the same time as the National Budget is submitted. Although this adds to the responsibilities of local authorities and the county councils, it is a suggestion which admittedly would keep the public informed as to the progress of local expenditure, indebtedness, and obligations.

All that the country wants is that money that is spent by local authorities shall be well and usefully spent, and not extravagantly. But it is perfectly obvious from past experience and the present position of the rates that fresh methods are required in order to obtain true regulation and control of local finance. Greater publication of financial information will enable the ratepayers to take such action as may be necessary to safeguard themselves against extravagant and needless expenditure, and to do what was recommended in the report of the Select Committee on the Procedure Governing Bills—that is, take steps to offer opposition to measures promoted by local authorities which may be regarded as exceeding the necessities of the time, or which involve expenditure of a prodigal nature, or which it would be better should be incurred by private enterprise, and not by municipalities with a *penchant* for speculative

* See "Journal" for Jan. 19 last, p. 169.

schemes. We offer no particular comment upon the proposals contained in the Bill. These will, we hope, be fully thrashed out, in due course, in the House. Our only concern is in the efforts that are being made to "stem the tide "of rising rates," in view of the fact that the gas industry is a considerable payer of rates and taxes, which item helps to make a very appreciable difference in the charge for gas per 1000 c.ft., or per therm, sold. As was noticed in the "Journal" for March 30 [p. 795], the amount required for rates and taxes in 1920 in the case of one large company was equal to 4·31d. per 1000 c.ft. sold. This is a big figure; and it is an alarming fact that the sum paid in the year for rates and taxes by the Company exceeded by many thousands of pounds the dividend on the ordinary capital. In these facts complete justification is found for the interest of the industry in this matter of high rates.

Interesting Variations in Gas Legislation.

We are glad to see that a House of Commons Committee have agreed to certain variations from general gas legislation in dealing with the Harrogate Gas Company's Bill, the proceedings upon which before the Committee were reported in last week's issue. While principles that are good for the industry should be followed as far as possible, local conditions should always receive consideration in respect of terms. This has been fully acknowledged by Parliament in connection with the declaration of calorific power by each gas undertaking. It is also acknowledged in the differences in therm prices, which are justified by the circumstances of each concern. It has also been acknowledged in the departure from the sliding-scale which the South Metropolitan Company effected, and which departure allows a minimum dividend, and a regulated division of profits when the price charged for gas is below the basic price.

The Harrogate Gas Company were proposing to follow the South Metropolitan Company's profit-division plan; but since their Bill was introduced, they have been in conference with the Corporation with the view of settling differences regarding the Bill, with the result that a change was made from the South Metropolitan scheme. We cannot truly say that we like it so well as the South Metropolitan plan; but with a 10 p.ct. dividend on the consolidated stock, objection to the alteration can be discounted almost to the verge of total disappearance. Why we do not like it is that the proprietors will not receive any additional dividend when the price of gas is below the basic price. One inducement to price reductions is therefore cut-away, though we know the management of the Company well enough (present and past gas prices are certificates of merit in this regard) to be fully satisfied that the price will always go down to the point which prudent management can permit. There still remains in the Bill an inducement, in that, when the price is below the basic figure, a certain sum will be taken from the profits for the benefit of the employees under a co-partnership scheme. Outside, there is the most effective of all inducements—competition—to reduce the price to the lowest possible figure. However, what has been agreed with the Corporation is this: The Company are to have a maximum price of 1s. 1⅜d. per therm; and a basic price of 1s. 0⅜d. For every ⅛d. by which the selling price per therm is reduced below the basic price, the Company will be able to take from profits ½ p.ct. of the aggregate amount of the salaries and wages of the employees (but not exceeding 6 p.ct. upon the amount of the salaries and wages), and carry it to a co-partnership fund for division. This will give the employees a real interest in the economic working of the concern.

In two other respects there have been certain departures. One has reference to pressure. In the case of premises situated at a lower level than 200 ft. above Ordnance Datum, the minimum pressure is to be 1½ in. This is a point that might be borne in mind by undertakings with large differences of level in their area of supply. But in all other cases in the Harrogate area, the Gas Regulation Act pressure provision will apply, subject to the stipulations made by the Board of Trade, as set forth in the "schedule" printed in the second column of p. 799 of the issue of the "Journal" for March 30. The other point alludes to a variation of the Gas-Works Clauses Act, 1871, in respect of the distance from the main within which the Company are under an obligation to provide a supply of gas. For nearly sixty years it has been obligatory upon the Company to provide a supply if the distance does not exceed 50 yards. The Bill proposed that the consumer should pay the cost of the work, or agree to take a supply for a certain period. The Corporation opposed this; but, by giving to the owner or occupier of the premises the following option, the Company have secured the right to payment in this alternative form: The owner or occupier may either repay the Company the cost incurred by them in providing and fixing or laying the meter, main, or extension of main, and so much of the service-pipe as shall be laid on private property or in any case beyond 30 feet in length, or enter into a written contract, if required to do so, to continue to receive and pay for a supply of gas for a period of at least four years of such an amount that the rent payable for same shall not be less than 25 p.ct. per annum on the outlay incurred by the Company in providing and fixing or laying the meter, main, or extension of main and service-pipe. There is more reason than ever now for protection in this regard, in view of the higher costs, and the fact that a consumer, after the Company have incurred the outlay, might be induced to change-over to a competing agent.

However, the main thing is that these changes indicate the intention of Parliament not to adhere slavishly to precedent and general rule, but to consider variations on the merits of individual cases. This is as things should be. And it might be carried further—for example, in respect of the limitation of the purchasing power in regard to secondary products to one-third of the amount of an undertakings own production. There should be absolute liberty in this respect, so as to enable the smaller undertakings to dispose of their secondary products to the best advantage, in order that their gas consumers may enjoy the benefit of the highest return possible for bye-products to lessen the high cost of coal. The Chief Inspector under the Alkali Works Regulation Act has on various occasions called attention to the waste of ammonia through the smaller undertakings running away their ammoniacal liquor owing to the absence of profitable means of disposal. The co-operation of larger undertakings might stop the continuation of this waste. We hope that, when the Model Bill is under discussion, this point will be thrashed out, and that the liberty which a Committee of Parliament said the industry should possess in this regard will be assured to it. This would be quite in accord with the spirit of the Gas Regulation Act.

Domestic Consumers, and the Over-all Value of Gas.

Although the demands on our space have insisted upon shortened reports being given of the proceedings at the District Conferences of the British Commercial Gas Association, the accounts we have published impress us with matters which might be urged somewhat more powerfully by gas undertakings on the attention of the public in their respective supply districts. The Association are constantly engaged in putting forward the aspects of the matters that we have in mind; but they require the supplement of local energy. Consumers have got used to the modern prices of gas. We hear less grumbling over them than was formerly the case. There is now public recognition of the fact that, coal being the raw material of gas making, and labour, plant, goods, and materials generally having gone up so heavily in cost, gas suppliers cannot help the ascent of their charges by, according to circumstances, 50 to 100 p.ct. compared with June, 1914. In some cases, the 50 p.ct. even has not been touched. The charges made are the bare costs, with something moderate added for capital. The consumer now only pays for the heat units or the volume of gas that he receives; but he seems totally to ignore the fact that, in paying for and using gas instead of coal, he is paying for and using something that saves household labour and time, and the saving of labour and time is worth solid money. By using gas, too, in place of bituminous coal, the householder is securing air sanitation, and so health-promoting conditions. To every individual, there is value in this—to the household, and to the community generally. No one can estimate what is the over-all value of gas; but it is clear from the charges made that, despite the money-saving and the health-promoting advantages of gas, the consumers pay nothing more per therm or per 1000 c.ft. than will allow the vendors of the gas a modest profit.

A great deal has been said at the conferences regarding these matters; but the truths want to be effectively preached in the highways and the by-ways of our communal life. The facts also need to be drummed into the ears of our housing authorities. Gas is doing excellently in connection

with the housing schemes, even in respect of lighting, which the electrical profession thought to capture wholesale, but now find that the fact has taken deep root and is flourishing among housing authorities that, as gas must be taken to the houses for cooking, heating, and hot-water provision, it is more economical to tap the same gas-mains for lighting than to incur heavy expenditure on electric cables, services, meters, and fittings, which may prove, through the limited consumption of current for lighting only, to be a piece of unprofitable and therefore indefensible speculation. In some places where electric lighting has been put into these houses, the time will come when the result will stand as a reflection upon local administration; and the pig-headedness and bias through electrical ownership that caused the waste will receive merited condemnation. The district conferences of the "B.C.G.A." have shown, and are showing, that, if housing authorities recognized to the full the part that gas can and does take in bringing into the life of the people new, easier, and more healthful and comfortable conditions, they would look with greater approbation upon the principle of monetarily assisting in the provision of the piping and appliances that would bring inestimable advantages to the tenants and the community generally. The utilization of gas stands for structural economy; and 2 or 3 p.ct. upon the actual cost of the houses would make a provision for the use of gas which would quickly bring its rewards in time and labour saving and a cleaner and therefore more healthful atmosphere than would be the case where coal is the heating and cooking agent.

A good deal of information has been given at the conferences—of course, for local edification—regarding the therm basis of charging, and the fact has been impressed that under it the consumer will always be purchasing heat units and not volume. We have punctuated the fact that the consumer makes a good bargain in buying and using gas, in that it not only performs the duties required, but saves labour and time and promotes health, as to which an assessment of money value cannot be made. But the value is there—it is material, and not merely hypothetical. Beyond this, the consumer is going to get the large protection that the Gas Regulation Act provides for him in assuring that he receives the full thermal value he is charged for; and, to ensure that he does so, gas suppliers will always guard themselves against the ignominy of being found guilty of giving "short measure," by providing a full measure of heat units per cubic foot, and something over as a margin of safety. Taking these various points into account—labour and time saving, the promotion of healthful conditions, and excess heat units—it is plain that the gas consumer obtains an over-all value in the gas he uses exceeding the actual price that he pays per therm.

If a Limit to Inerts is Imposed!

The Inerts Committee had a busy time last week. They held three sittings, and heard a mass of evidence from the side of the gas industry (to supplement that previously submitted) from Mr. A. E. Broadberry, Mr. T. F. E. Rhead, Mr. Thomas Goulden (President of the Institution of Gas Engineers), and Prof. J. W. Cobb, Livesey Professor at the Leeds University. This is a strong quartette, and the cogency of their arguments should prove irresistible. Far be it from us to suggest that there are even signs that the Committee are going to impose a limit to inerts. If they did such a thing, it would be altogether opposed to the weight of the evidence that has been laid before them. A Committee composed as this one is could hardly do this without showing that there was both theoretical and practical justification for it; and if there is any practical justification, whether it is not outweighed by the practical justification for not doing anything of the kind. It was, however, very noticeable that the witnesses were pressed by members of the Committee to say—and particularly so the President of the Institution—what they thought should be the maximum limiting figure if one were imposed. With the knowledge before them that inerts in gas can do little or no harm to the consumers under the therm basis of charge, that gas engineers will naturally keep them down to as low a level as coal and plant conditions will allow (in view of the fact that they do not want to use their mains for transmitting waste material more than is necessary), that some few years must pass before plant can be restored to a sound condition and capacity from the ravages and the extension impossibilities of war time, and that gas men are looking to manufacturing developments of which the conditions in result cannot be defined, the only possible reply for the witnesses to give was that there was no necessity for a limit, and that a limit would be economically unsound.

The railway companies have suggested a limit of 6 p.ct. per 100 B.Th.U. per cubic foot, which means that as the calorific value descends, so would the inerts, which is altogether against common sense and theoretical and practical considerations. As the calorific value goes down, the more probable is it that the inerts in the gas *per se* will ascend; as the concentration of heat energy per cubic foot increases, the lower will be the inerts in the gas *per se*. But the railway companies suggest that these conditions should be reversed. The higher, however, the B.Th.U. per cubic foot, the greater the amount of air required for complete combustion; the lower the B.Th.U., the lower the quantity of air needed for complete combustion. Hence the inerts in the gas-air mixture are normally about the same. Yet the railway companies propose to allow more inerts in the gas that requires the most air for its complete combustion! It is not likely, with the chemical authorities upon it, that the Committee will be trapped by the railway companies' specious suggestion, the application to which of the most elementary considerations shows its foolishness. But there was the persistent pressure to get a figure named as the limit which the gas industry could accept, and which could be made generally applicable without any particular hardship to a gas undertaking whatever its conditions and whatever the prospects of manufacturing developments. At last Mr. Goulden had to yield to the pressure, and suggested 30 p.ct.; but this should be independent of air, and should not come into force for a few years. At the same time he protested against limitation at any point. If there is no theoretical or practical reason for imposing a limit, why set up one at all—particularly with the array of reasons against any such imposition? The idea of inert grading with variations of calorific power, and along the lines suggested by the railway companies, is as fatuous and illusory a proposition as could have been put forward. However, the Committee have not concluded the hearing of evidence yet; but we do hope, without anticipating the issue of the inquiry, that no limitation will be suggested that has no justification, or even one which will merely serve as an excuse for the clamour that has been made over this matter on grounds that have not stood the test of scientific investigation.

Gas Restrictions and Circular to Gas Consumers.

In last week's issue, attention was called on p. 141 to the suggestion of the Mines Department, that gas and electricity undertakings should circularize their consumers, urging them to reduce their consumption as much as possible. The lines of the methods by which this could be done were then stated. The National Gas Council, in compliance with a request of the Mines Department, communicated with each member urging that steps be taken immediately to carry out the suggestion as to a circular.

The Strike and Gas-Cookers.

During last week, some of the local authorities, owing to the wretched shortage of supplies of coal, were more or less compelled to deal with applications for domestic coal permits in an arbitrary fashion. They were helpless in the matter, though sympathetic in view of the cold north wind and the low atmospheric temperature that generally prevailed, which caused a large amount of suffering. They felt that coal should be distributed to meet the requirements for cooking rather than for personal warmth; and that where gas-cookers existed, there should be no coal permit. Nothing was said about electric-cookers. Perhaps the authorities regarded these as a negligible quantity in the situation—the same as many of those do who have been induced to become the possessors of the costly and unreliable things. The refusal of coal permits where gas-cookers exist occurred in certain Metropolitan suburban areas; and information was received that, as coal stocks were becoming more restricted, the same practice was being followed in certain places in the Provinces. It is a pity the authorities did not, in view of this, act fairly, and make the use of electric-heaters an offence; seeing that every unit (only 3420 B.Th.U.) of electricity used for heating means the consumption of 3 to 5 lbs. of fuel at the gene-

rating stations, and at some stations more. The demand for gas coke gained in volume; but it is curious that many people who went cold overlooked this source of fuel, notwithstanding the announcements in the newspapers.

Zoning and Grading.

It is understood that, with one exception (at the end of March), the question of zoning and grading has been settled by the Regional Councils throughout the country. A few outstanding points have yet to be dealt with in connection with the London area; but there is good expectation that these will be settled very soon in a satisfactory manner. It has been a long job, owing to the intricacies and ramifications of the questions involved, in view of the dissimilar circumstances of undertakings and grades of men and character of duties. However, the Regional Councils are to be congratulated on the work accomplished; and though we have not been behind the scenes, it is quite evident that a good spirit and feeling must have prevailed between the representatives of the men and those of the Federation of Gas Employers for them to have so successfully overcome the difficulties that stood in the way of agreement.

American Coal.

Last week data were given as to recent exports of American coal to European countries. It is now reported that a considerable amount of American coal has been offered to coal factors in this country; and only labour and other difficulties have prevented any general acceptance of the offers. Moreover (so the statement intimates), the Government are commandeering all the coal that comes into the country; and for this reason delivery could not be guaranteed for at least three weeks from the present time. Some coal it is reported is already on its way here; and there is plenty ready for shipment in the United States. Supplementing the figures published last week, Mr. Finlay A. Gibson, Secretary of the Monmouthshire and South Wales Coal Owners' Association, has supplied some figures which show how severely America has cut into our export trade through the inability of this country to compete in the matter of price. In January this year, America exported to Europe 423,600 tons, and to other countries 1,824,848 tons—together 2,248,448 tons—an increase of 999,281 tons compared with January, 1920, or 80 p.ct. In the seven months ended January, the export of American coal to Europe was 6,745,548 tons, and to other countries 18,009,928 tons—together 24,755,476 tons, or an increase of 12,413,210 tons (100·6 p.ct.), compared with the seven months to January, 1920. During the whole of last year we only exported 24,931,853 tons—about the quantity that America exported in seven months. In 1913 we shipped 73,400,118 tons, or close upon 50 million tons more than in 1920. Mr. Gibson also states that the f.o.b. price of American coal is about 33s. 6d. per ton; whereas the South Wales cost price f.o.b. in March was about 58s. 6d. per ton, or 25s. per ton higher. There are figures here for British miners and owners to digest. They give a sharp reminder that we cannot control the markets abroad along the lines which have been pursued the last few years.

Gas Oil Imports.

The gas oil imports for last month amounted to 4,282,603 gallons, compared with 2,048,027 gallons in March, 1920. But for the three months ending March last, the total imports have remained about stationary. The decline of carburetting is accountable for this; and the decline is due to both the price per gallon and the greater knowledge possessed as to the effective value of heat units in the form of gas. During the past week there was a reduction of 1½d. per gallon in the price of gas oil—making it 9½d. net and naked, *ex*-wharf.

Coke Exports.

There is news now in the Board of Trade returns as to the values of gas coke exported from this country during the first three months of this year. During March, 68,230 tons were shipped; and the value was £153,515, or roughly £2 5s. per ton. In March last year, 56,904 tons were taken across seas; the value being £277,692, or £4 17s. 7d. per ton. Yet it was not till the autumn of last year that the heavy prices of which so much was heard were realized. In the three months ending with March, only 171,711 tons of gas coke were shipped, of an estimated value of £468,886, or an average of £2 14s. 7d. per ton. In the corresponding period of last year, 217,577 tons were exported, of a value of £1,005,687, or an average of £4 12s. 5d. per ton. The terrible drop that there has been in the "other sorts" of coke (practically the metallurgical variety) is shown by the fact that last month the exports only amounted to 20,841 tons, as against 129,039 tons in March, 1920. In the three months to the end of March, the total quantity shipped was 56,183 tons, as compared with 477,594 tons in the first three months of 1920. This is a serious drop; and combined with the industrial depression in this country before the coal strike, it accounts for so many coke-oven plants having closed down. And this is an almost general condition since the beginning of the strike.

PERSONAL.

We learn with regret that Mr. C. Valon Bennett, Engineer, General Manager, and Secretary to the Rochester, Chatham, and Gillingham Gas Company, has been ordered by his medical adviser to take a complete rest from business for two months. We understand that Mr. Bennett leaves England on the 29th inst. by the Union-Castle Liner "Briton," for a voyage to South Africa.

Mr. E. Honoratus Lloyd, K.C., who is a Director of the South Metropolitan Gas Company and the Bournemouth Gas and Water Company, and was lately appointed Recorder of Chester, has intimated that, acting under medical orders, he intends to retire from practice at the Parliamentary Bar. News of Mr. Lloyd's illness was received with great regret in the Committee Rooms, where, as in other quarters, he is held in high esteem. His many friends will join with us in the hope that Mr. Lloyd may have a speedy return to health.

Alderman Forrester Clayton, of Brentford, has been re-elected Vice-Chairman of the Middlesex County Education Committee.

The Directors have appointed Mr. S. H. Wheble to succeed Mr. W. Wilberforce as Sales Manager to the Aldershot Gas, Water, and District Lighting Company. Mr. Wheble served in the war as a Lieutenant in the Queen's (Royal West Surrey) Regiment.

Mr. F. Ruschitzko, Gas Manager at Bagnalstown, has been transferred to the Wicklow Gas-Works.

OBITUARY.

Mr. William Hutchison, the founder of the Burnden Tar Company (Bolton), Ltd., died suddenly on the 22nd inst., at Bolton. He was 67 years of age.

Congress of the Société Technique.

Last week's "Journal des Usines à Gaz" contains the programme of this year's Congress of the Société Technique de l'Industrie du Gaz, which is to be held in Tours on Tuesday, June 14, and the days following. The banquet customarily given by the Compagnie du Gaz de Paris will be on the Tuesday, and that of the Société on Wednesday. On Thursday there will be an excursion to the Haye-Descartes paper-mills and to five of the historic chateaux of Touraine.

The Inerts and Carbon Monoxide Committees.—In another part of this issue there will be found a report of last week's proceedings of the Committee on the Limitation of Inerts, who are meeting again to-day. As to the Carbon Monoxide Committee, we have, on inquiry, been officially informed that they have not yet decided whether it will be necessary for them to hear further evidence.

Gas-Fired Crucible Furnaces.—Addressing the Sheffield Society of Metallurgists, Mr. F. M. Parkin spoke of gas-fired furnaces for melting crucible steel as being superior in all respects to the coke-fired furnaces which have been employed ever since the crucible process was invented. There are a number of gas-fired crucible furnaces in Sheffield; but the newer method is in its infancy. Mr. Parkin said that gas-melting was cheaper than coke fuel, the operation was less arduous for the workmen, and the product—at any rate as regards composition—was superior to the material made with coke.

In view of the present industrial crisis, the Council of the Eastern District Section of the Scottish Junior Gas Association have decided to postpone the annual general meeting.

Mr. Cyril G. Davis, of No. 60, Oxford Street, W., and Luton, asks us to point out that he is in no way connected with the firm of Cyril Davies and Co., Ltd., of No. 231 and 232, Strand, W.C.

INSTITUTION OF GAS ENGINEERS.

A Paper by Sir George Beilby.

Included in the programme of the Institution's forthcoming meeting will be a paper on "Steaming in Vertical Gas-Retorts," by Sir George Beilby, F.R.S., Director of Fuel Research of the Department of Scientific and Industrial Research, describing the experiments carried out by the Department.

In connection with it, members will be invited to visit, in small parties, H.M. Research Station at East Greenwich from 10 o'clock on Friday morning, May 27. Full particulars will be announced in the usual detailed programme of the meeting, which is to be issued next month.

It may be added that candidates desirous of being elected at the meeting should return their forms of proposal to the Secretary at No. 30, Grosvenor Gardens, Westminster, for consideration, not later than April 30. Invitations to attend the meeting will be issued to accepted candidates.

THE LATE MR. WOODWARD.

In the "Journal" for March 9 the death was recorded of Mr. William Woodward, for many years Engineer of the Bromley (Kent) Gas Company, and a few particulars were given of the work he accomplished for the gas industry. We have since received from one who is well acquainted with the deceased gentleman's life's work some more extended account of what was accomplished during Mr. Woodward's residence at Bromley, as also at works in the North of England.

Our correspondent writes that Mr. Woodward possessed more than ordinary skill as a mechanical and civil engineer, and progressive design was a big feature of his professional work, which especially in connection with stoking machinery was quite unique. The Arrol-Foulis machines at Bromley were completely redesigned and reconstructed in the workshops there; while a pusher-discharger of a highly original and efficient type was also designed and constructed at Bromley.

In the matter of engine design Mr. Woodward was singularly adept; hydraulic pumping engines and exhauster engines being designed in detail in the drawing office at the Bromley works. In architecture and building construction his skill was again evident in some of the buildings and engine-houses at Bromley, which are remarkably fine in design and style.

His original work in gas engineering includes, among other things—(1) Improvements in regenerative retort-settings and stoking machinery; (2) adapting a single producer to supply a number of retort-beds, so as to save extensive excavations in bringing an old retort-house up to date; (3) improved coke-handling and labour-saving plant; (4) a simple and lasting form of sulphate saturator constructed of copper; (5) improved retort sectional form, specially adapted to suit pusher-dischargers; (6) retort-house governors housed in a special building away from the usual unsuitable position on top of the retort-bench; (7) original housing and coke-bunker arrangements for a twin-generator carburetted water-gas plant; (8) the adoption of centre-drive rotary gas compressors and exhausters (compressors for the supply of distant holders through small steel main); (9) the use of enclosed pressure lubricated vertical engines for driving compressors and exhausters; (10) the adoption of rack-sliding gate-valves for the inlet and outlet of an exhauster, to replace an unreliable disc-type valve; (11) fitting overhead cranes in all engine-houses, to facilitate erection and repairs; (12) the adoption of the "Venturi" type meter for use for the first time as a gas station meter; (13) a unique arrangement of liquor supply to, and of tar outlets from, tar towers; and (14) an adjustable seal. Nearly all reconstructions and extensions at Bromley were done by the Company's own staff, under his supervision.

Mr. Woodward was a keen sportsman, and in his younger days played county cricket.

Since his retirement, he was keenly interested in motoring. Many improvements in the petrol engine and automobile construction show his skill in this direction.

He was an enthusiastic art collector—his collection of bronzes being remarkably good.

North of England Gas Managers' Association.—The annual general meeting of the Association is to be held in the Gas Offices, Grainger Street, Newcastle-on-Tyne, on Friday, May 6, at 2 o'clock, under the presidency of Mr. Arnold W. Branson. Papers are promised by Mr. C. H. Chester, F.C.S., on the "Principles of the Tully Plant and its Adaptation to Modern Gas-Works Practice," and by Mr. F. H. Robinson, Assoc.M.Inst.C.E., on "Experiments in Complete Gasification at Harrogate." A presentation will be made to Mr. Herbert Lees, on his retirement from the position of Hon. Secretary and Treasurer; and his election as an honorary member of the Association will be proposed by the President. Resolutions amending the rules in certain respects, of which notice was given at the last general meeting, will be submitted to the members. Tea will be served at the close of the meeting.

ELECTRICITY SUPPLY MEMORANDA.

Up North the Chambers of Commerce seem to be almost unanimously against the proposed joint authority schemes; and the prospect of possible claims upon the rates are apparently at the bottom of their hostility. They have good cause for preferring the security that private enterprise gives them against this sort of thing, with before them the heavy taxation and rate-levying that obtain in the present day, and with the knowledge that in many places electricity supply by local authorities also means a direct charge upon the rates for the maintenance of electricity concerns owing to the insufficient prices of current. Some views that appear in a report by a Committee of the Leeds Chamber of Commerce upon the three schemes that have been put forward for the West Riding of Yorkshire reflect a large mass of opinion throughout the country. The three schemes respectively emanated from the Bradford Conference of Local Authorities, the Leeds Corporation, and the Yorkshire Power Company. The Electricity Commissioners' inquiry into these schemes has already opened. It was to be resumed on the 12th inst.; but owing to industrial conditions, the renewal of consideration has been deferred until the position becomes more settled. The report of the Committee of the Leeds Chamber of Commerce is therefore in good time. They express their strong opposition, on general grounds, to the extension of national and municipal trading, and consider that private enterprise, with proper safeguards, is, in the interests of the consumer and the community, better fitted to carry-on work of this nature. They see no reason for establishing a joint electrical authority in the district on the lines of either the Bradford or the Leeds scheme. They are thoroughly in favour of private enterprise, and have nothing but praise for the Yorkshire Electric Power Company. It is plain from this and other sources of information that the Power Company have powerful friends among the manufacturing and business men in its area. And such men ought to know what service the Company have rendered them. The Committee consider that the Company, having regard to the difficulties they had to overcome, have served the area well, and that any interference with the authority and powers of the Company would retard the supply of electricity, and involve the community in risks which ought not to be undertaken at the present time, when every endeavour should be made to avoid unnecessary and speculative capital expenditure by public authorities. At the meeting of the Chamber at which the report was adopted, the Chairman remarked that they were going to back-up the Company in every possible way. The Halifax and the Spenborough Chambers of Commerce are also in favour of private enterprise; and the Elland District Council are going to support the Company's proposals. It is abundantly clear that the joint electricity schemes are going to revive the opposition to municipal adventure, and perhaps in stronger form than ever. The "Electrician," we see, does not believe that "a joint authority, if its business is undertaken and extended in a proper business-like way, need involve any charge upon the district rates." This is only an opinion, without anything substantial to support it. The business men of the Chambers of Commerce prefer not to take any risk. They have experience, and are quite satisfied with private enterprise. Moreover, they know that local authorities have not all a clean sheet in connection with electricity supply so far as the rates are concerned.

Chambers of Commerce in Opposition.

In Defence of the Ratepayers.

A serious attempt is to be made by the Local Rates (Increase Prevention) Bill, which is down for second reading in the House next Friday, to stem the tide of rising rates, by a tighter control over local expenditure. A paragraph in last week's "Journal" announced that the Electricity Supply (No. 2) Bill has been reintroduced, owing to the pressure exerted on the Government, in order that the joint authority schemes and the work of the Electricity Commissioners may be made effective. As things stand, without financial authorization, there could only be an abortive result to all that has been and is being done. It is not difficult to prophesy that the Bill will not have an easy course. Every month that passes has made its chances worse, in view of rising rates and taxation, and the consequent spread of indignation. "Electrical Industries" calls attention to an article that has appeared in "The Financier," which is described as a "full and incisive" indictment against clause 4 of the Bill, which enables local authorities to draw upon the rates to finance joint electrical schemes. The points made are these: That the demand for economy is a national one; that the electricity supply development which the Government propose to place in the hands of *quasi*-public bodies is a speculative one; that the capital sum involved will amount, according to the Lord Chancellor's estimate, to hundreds of millions; that experience with the Metropolitan Water Board, confirmed by telephone history, proves that the control of public services by *quasi*-public bodies results in heavy losses; that the burden of the rates has increased more than twofold since 1913, and is still increasing; that no further addition to this burden can be tolerated; that a Select Committee of the House of Commons has reported that the ratepayer requires special protection against Bills—such as the Electricity Supply (No. 2) Bill—which involve fresh charges

on the rates; that it is impossible to place any limit on the extent to which the rates would be called upon in connection with clause 4 of the Bill; that on general and on particular grounds the clause should be opposed by every interest concerned in the maintenance of the nation's financial stability, and in the promotion of public economy. There will be much agreement with these submissions. At the same time, we do not see that gas companies could effectively oppose the Bill, save with the view of obtaining substantial safeguards against these schemes becoming a charge on the rates. But there is the rub. What other source is there from which deficiencies can be made good at all events until the new stations and transmission lines become well loaded? Then, of course, care would have to be taken that the prices charged to the authorities drawing current were at levels that would cover all costs involved in rendering the service. In the case of private enterprise a way has to be found for meeting the claims of capital expenditure while unproductive, and in the case of these joint authorities the money required to meet the same claims should be a charge spread over the first years of productiveness.

Preliminary Costs.

A Committee of the London County Council recently drew attention to the heavy expense that had been incurred in connection with the preparation of a joint scheme of electricity generation for the London and Home Counties Electricity District. But no figure was named. The Walthamstow District Council are one of the minor authorities in this connection; and they apparently are also apprehensive as to the costs attaching to the Conference of Local Authorities Owning Electricity Undertakings in Greater London. The Hon. Secretary of the Conference has forwarded to the Walthamstow Council a revised estimate of the cost of promoting the scheme, and has desired them to double their contribution—increasing it from £120 to £240. Should the recommendation of the Electricity Committee be confirmed, the Council will withdraw from further participation in the Conference. If £240 is Walthamstow's share of the preliminary expenses, then what must be those of the larger authorities?

A Lump Sum Plus a Unit Charge.

The electricity industry has adopted some curious fundamentals for its tariffs during its history, owing to the double wiring and meter difficulties, in order to attempt to develop the uses of electrical energy for purposes other than lighting. The fixed charge on rateable value is one of the freak systems, which as we recently saw [p. 81] causes the man who has a high rateable value, but is economical in his consumption of electricity, to pay considerably more per unit than the householder whose rateable value is low but who is extravagant in his consumption of current. The latter gets a bigger service than the former for the total money he pays, and so a lower average rate is paid by him per unit. The electrician when confronted with instances of this kind merely shrugs his shoulders, and says such discrepancies cannot be avoided in these plans that are adopted on the grounds of expediency. Nevertheless, the difference in charge per unit for a consumer who is equally as good as another who pays less, is not just. The same argument applies to the basis of charge which has been adopted at Dundee, and about which Major H. Richardson, M.C., President of the Incorporated Municipal Electrical Association, wrote in the "'Electrician' Trade Promotion Number," which was noticed last week. The gallant Major does not think much of some of the tariffs that have been adopted by the industry in the past. He acknowledges that the gas competitors can give a single service, and that their apparatus is very much cheaper in first cost; and this is the main reason why he holds that, unless a more popular method of charging for electrical energy can be devised, the maximum business obtainable for domestic heating and cooking will only be from the wealthier class, who represent a "mere fraction of the field which might be cultivated." Major Richardson does not imitate some of the electrical noodles who run-down the gas competitor. But his submissions acknowledge, as plainly as anything can do, that the vaunted virtues of electricity for heating and cooking—among which cost, reliability, and other things do not count—are insufficient to carry it through in competition.

A Tariff on Floor Area.

What has been done in the case of Dundee is to have a fixed and running charge the same as on the rateable value system. But, instead of taking rateable value as the basis, a fixed service charge is made of 2s. per 100 sq. ft. of area of the living rooms per quarter; and, in addition, all units registered through the meter for whatever purpose are charged at the rate of ⅛d. per unit. Now what has the area of the rooms got to do with the costs incurred in the generation, distribution, and supply of electrical energy? It is the queerest basis of charge for such a service of which we have ever heard, though a sarcastic electrical man once suggested that the area of the buttons on the coat of a householder might be taken as the basis of charge. In the case of a domestic consumer, the area of the living rooms only is taken; such places as landings, bathrooms, cellars, &c., are not brought into account. What this means is that the householder who wants to have his electrical energy at a cheap rate must pick out a house containing living rooms of small area. This would bring down his fixed service charge; and for an equal quantity of current he will get it at a lower average per unit than the man who prefers larger rooms. But why should he? Why should the man be penalized who prefers larger living rooms, but uses no more current? The whole thing is absurd as a business transaction. The man living in the large rooms would have to waste current to bring down his average cost per unit to that of the man whose consumption was equal, but who lived in smaller rooms. The whole system is an absurdity. Major Richardson takes it as an evidence of popularity that, though the system was only put into operation last June, there are 1000 consumers (domestic, shop, warehouse, and other trading premises) who are taking advantage of it. The fixed charges alone bring in about £8000 a year, or an average of between £7 and £8 per consumer per annum. We do not take this as an evidence of popularity, so much as an evidence of the willingness of people to take advantage of even a trading absurdity if it suits them personally to do so. But it does not assert the soundness of the system. Major Richardson himself only defends it on the ground of expediency. Concluding his article, he says: "While it is not claimed that such a tariff is by any means perfect (and while it has been looked upon, in some quarters, as bold) I am fully convinced after a short trial period that the fixed and running charge tariff, if based on simple lines, such as the foregoing, will sweep away a multitude of difficulties when pushing the sale of electrical energy for purposes other than pure lighting in the domestic class.

German Meters.

The electricity industry was a good customer before the war for goods of German manufacture. But quite early in the war, there were pious resolutions on the part of electrical men that, come what may, they would never again help to support German trade. Since those days, things have changed remarkably. Goods in this country are dear; goods in Germany are relatively cheap. Then again Germany has caused a prodigious amount of devastation which has to be made good; and our Government are desirous of collecting 50 p.ct. of the value of all goods that come to this country from Germany, either directly or indirectly. The Swansea Corporation Electricity Committee are uncertain which of two courses is the right one for them to pursue. They want to be patriotic; and they desire at the same time to serve the interests of the town by purchasing meters at as low a price as possible. One British firm offered meters which had been purchased from Germany. These are cheaper than meters of British make that were offered by another firm. When the matter was before the Committee, they discussed the point as to whether, if the German goods were purchased, 50 p.ct. of the money paid would go to the British Government under the Reparations Act. But opinions differed. Mr. Clarry suggested that the order be divided between the two firms. The Committee, however, took further time to cogitate privately over the matter before coming to a decision.

Standards for Gas Service.

To the three previous editions of a circular of the United States Bureau of Standards dealing with the subject of "Standards for Gas Service," has now been added a fourth, which presents a complete *résumé* of State and city regulations now in force defining gas service, and brings up to date the discussion of technical requirements and the Bureau's recommendations of rules and ordinance forms. Though, of course, the circular deals with conditions prevailing in the United States, much of the information possesses naturally a wider interest. Attention is drawn to the special importance of the maintenance of a uniform heating value of gas, and to the fact that the standard adopted must be suited to existing circumstances, types of processes in use and quality of gas-making materials economically available having an important bearing on the subject. As these factors change from time to time, alterations in the heating-value requirements may also become desirable. The Bureau believe that for the United States a value somewhere between 525 and 585 B.Th.U. will usually prove to be the best average heating value standard. With gas produced by special processes, or where coke-oven gas is washed for the extraction of light oil, average values lower than 525 B.Th.U. may prove economical. Further, in view of the serious shortage and high price of oil for water-gas manufacture, it would appear that considerably lower standards for water gas may be necessary than have been fixed in the past. The Bureau also recommend that maximum and minimum limits be placed 20 to 30 B.Th.U. above and below the average value fixed, and that the daily average heating value be required to remain within these limits. The Bureau think it is probable that, under present conditions, pressures should not exceed 6 in. to 8 in. at the outlet of the service-pipe to each consumer, except where appliances have been carefully adjusted for efficient work under higher pressures.

Studies in the Distribution of Mineral Matter in Coal.—A reprint from the "Transactions of the Institution of Mining Engineers" has been prepared of the paper (and the discussion upon it) which was read by Dr. R. Lessing at Doncaster last January, dealing with some "Studies in the Distribution of Mineral Matter in Coal." An abstract of the paper appeared in the "JOURNAL" for Jan. 26 [p. 233]. The pamphlet containing the full text is published at the offices of the Institution of Mining Engineers, Albany Buildings, No. 39, Victoria Street, S.W.

SOME DISPLAYS AT THE BUILDING EXHIBITION.

In all respects fully up to the high level attained by preceding displays of the same series, was this year's Building Trades Exhibition at Olympia, which closed yesterday. The exhibits were of a practical and up-to-date character, and were closely inspected by a very large number of visitors. The scope of a show of this kind is, of course, a wide one; and among the many branches of the industry covered, it was pleasing to note that gas—so essential to both the architect and the builder—enjoyed a fair share of representation.

The capabilities of gas in connection with cooking and heating were well demonstrated by the Davis Gas-Stove Company, Ltd., who showed their latest types of cookers with efficiency burners; a well-selected series of gas-fires, including handsome specimens of the "Carolean" and "Georgian," with appropriate surrounds; their patent "Gascol" convertible combination gas and coal range, which is portable and self-setting; geysers of various patterns; their "N.H." washhouse boiler; and other specialities. Near by, the Nautilus Company pointed out the advantages to be gained by the adoption of their system of patent cast concrete gas-flue construction, and displayed some inexpensively built-in gas-fires. Particulars are available of a case in which the provision of the gas-flues referred to for two cottages (each fitted with four gas-fires) resulted in a net saving of over £62.

Richmond cookers and circulators found a place on the stand of the Staines Kitchen Equipment Company. The "Eqo" combination anthracite or coke hot-water boiler and gas-cooker (shown by Messrs. Robert Jenkins and Co., Ltd.) is a device by which the waste heat from the boiler is utilized for the cooker. The smoke outlet is at the side of the boiler, and conducts the boiler heat around the oven flues before it escapes to the chimney. A selection of their special types of gas ranges, cookers, and hot-water circulators were exhibited by the Stimex Gas-Stove Company, Ltd.; and there were also to be seen housing scheme cooking and heating stoves of various descriptions made by Messrs. Sidney Flavel and Co., Ltd., the Carron Company's gas and other stoves, the Lawson Manufacturing Company's "odourless gas-heater," and gas-cookers by the London Warming Company.

In addition to the firms already named, in the section devoted to water heating Mr. Thomas Potterton had a stand on which apparatus could be examined, and some of it seen in action. A special feature was made of thermostats for the automatic regulation of gas consumption; and there was a complete installation for the provision of an all-gas kitchen. "Victor" gas-heated apparatus for hot water supply and heating can be had in many different forms; and in connection with this, a special point is made of the facility it offers for producing a small quantity of hot water (say) for culinary use—practically on the lines of the geyser—without constantly heating the whole contents of the system, the effect of which in the matter of time and gas consumption will be readily understood. Ordinarily these boilers are manufactured of cast iron; but for use where lime is absent from the water, they are treated by a rustless process. Attention was also drawn to circulating hot-water radiators, heated by gas-boilers under thermostatic control, and a series of coke-boilers for use in large installations, where gas is not available or special circumstances prevail. The "Victor" complete apparatus in one of its forms (with boiler and cylinder combined) has been adopted for housing schemes by Borough Councils and others.

Messrs. Ewart and Son, Ltd., had fitted-up all their latest forms of geysers, &c., including the "Industria" water-heater, which can be fixed either in the bathroom or in the scullery, and will supply hot water under gravity to several points. There is a two-way cock, so that very hot water can be drawn off for sink use, or bath water at a lower temperature. The Ewart gas-copper is fitted with a special attachment so that the copper can be fixed on the floor, and will supply hot water through the outlet at the top direct into the bath. When the copper is required for washing purposes, the cold-water inlet can be entirely removed, to avoid contact with clothes. With the use of the Ewart gas-copper, the bath can be fixed without taps, as hot and cold supplies can be run through the copper. The "Hurry" Water-Heater Company also showed different types of apparatus suitable for use in connection with housing schemes.

Passing reference must suffice for some other exhibits, the nature of which is generally familiar to "Journal" readers. The first of these is the Aerograph Company's paint spraying apparatus. The British Uralite Company are successfully using "Asbestone" for elbows, tees, cowls, and flues—and, in fact, anything that has hitherto been made in galvanized iron. With it there is said to be no corrosion, which is an important point when used for flue purposes. The "Solignum" wood preservative stain (for the prevention of dry rot), manufactured by Messrs. Major and Co., Ltd., was exhibited, in conjunction with an attractive scheme of indoor decoration. Bricks for the insulation of boilers and retort-benches were among the specialities displayed by the Moler Fireproof Brick and Partition Company, Ltd., for whose products (in addition to high insulating and fireproof and sound-proof qualities) extreme lightness and strength are claimed. The patent fibre plugs of the Rawlplug Company, Ltd., are for employment in connection with the attachment of gas or other fittings to walls or ceilings. They are claimed to be invisible when in position; and their use prevents damage being done to decorations.

A special feature of the exhibit by the Stanton Iron-Works Company was the "Stanton Hume" reinforced concrete pipes, which are made (in sizes from 4 in. to 60 in. diameter) to withstand high pressures by a centrifugal process that extracts a large percentage of the water, and thereby ensures a hard, dense concrete. Messrs. Stewarts and Lloyds, Ltd., had a stand devoted to pipes and joints, showing the progress that has been made in the industry with which they are associated. The "Permac" jointing material of Messrs. Thomas and Bishop, Ltd., is satisfactory for steam, hot-water, and gas-pipes, as well as for chemical plants. Attention was called by the Torbay and Dart Paint Company, Ltd., to their popular "Novoid" concrete-proofer, "Everok" water-proofer, "Rencrete" weather-proofer, "Quelle" flame-proofer, and "Aurora" washable distemper. Concrete tanks treated with "Novoid" are suitable for oils, ammoniacal liquor, tar, and sulphuric acid; and the satisfactory behaviour of "Novoided" cement under pressure was demonstrated. There was a show by Winget, Limited, of concrete machinery, portable elevators, &c.

THE NEW HEAT-UNIT CHARGE FOR GAS.

Information for the Use of Staffs.

Many gas undertakings will now be considering the question of the preparation of information for the instruction and use of their staffs in connection with the heat-unit basis of charging. Mr. W. J. Sandeman, the Distributing Engineer and Sales Manager of the Croydon Gas Company, has had prepared a very useful pamphlet for use by his staff; and he has kindly forwarded a copy for reproduction in the "Journal." The information will, we think, be very serviceable to other gas men.

Introductory.

A British thermal unit (B.Th.U.) is the quantity of heat required to raise 1-lb. of water through 1° Fahr.

A Therm is 100,000 B.Th.U.

The number of therms in a certain quantity of gas =

$$\frac{\text{(Number of cubic feet)} \times \text{(Calorific value)}}{100{,}000}$$

Or the number of therms in 1000 c.ft. of Croydon gas of 470 B.Th.U. per cubic foot =

$$\frac{1000 \text{ cubic feet} \times 470 \text{ B.Th.U.}}{100{,}000} = 4{\cdot}7 \text{ therms.}$$

The number of cubic feet of Croydon gas in one therm =

$$\frac{100{,}000}{470} = 212{\cdot}7 \text{ c.ft.}$$

Comparative Costs of Lighting by Gas and Electricity.

Gas.	Electricity.
(*a*) *Domestic Inverted Incandescent Burners.*	(*a*) *Domestic "Osram" and "Mazda" Metallic Filament Lamps.*
Efficiency (based on 20 candles per c.ft.) = 23·5 B.Th.U. per candle-hour, or 4255·32 candle-hours per therm. With gas at 13·2d. per therm, 1000 c.p. for one hour costs 3·1d.	Efficiency = 1 watt per candle-hour. N.B.—1 watt = 3·42 B.Th.U. 1000 watts = 1 unit. With electricity at 8d. per unit, 1000 c.p. for one hour costs 8d.
(*b*) *Sugg's No. 2 Multiple-Burner Lamps.*	(*b*) *"Half-Watt" Lamps.*
Efficiency (based on 40 candles per c ft.) = 11·75 B.Th.U. per candle-hour, or 8510·64 candle-hours per therm. With gas at 13·2d. per therm, 1000 c.p. for one hour costs 1·55d.	Efficiency = ½ watt per candle-hour. With electricity at 8d. per unit, 1000 c.p. for one hour costs 4d.
(*c*) *Keith's High Pressure Lamps.*	(*c*) *"Flame-Arc" Lamps.*
Efficiency (based on 60 candles per c.ft.) = 7·83 B.Th.U. per candle-hour, or 12,771·39 candle-hours per therm. With gas at 13·2d. per therm, 1000 c.p. for one hour costs 1·03d.	Efficiency (with globe on) = 0·40 watt per candle-hour. With electricity at 8d. per unit, 1000 c.p. for one hour costs 3·2d.

Comparative Costs of Heating by Gas and Electricity.

5 therms consumed in an ordinary gas-fire, with fume-outlet attached to a chimney, are, in effective heat, equivalent to 73 units of electricity, converted into heat at 100 p.ct. efficiency.

5 therms (gas at 13·2d. per therm) cost to-day 5s. 6d.

73 units (electricity at 2½d. per unit) cost to-day 15s. 2½d.

N.B.—In this calculation 50 p.ct. efficiency has been taken as the figure for gas heating.

In the case of "Mars" and other flueless radiators, the efficiency of gas heating is 100 p.ct. A therm is therefore equivalent to 29 units of electricity.

Comparative Costs of Cooking by Gas and Electricity.

A practical test has shown that slightly less than 5 therms will do precisely the same work as 100 electrical units.

5 therms (gas at 13·2d. per therm) cost to-day 5s. 6d.

100 units (electricity at 2½d. per unit) cost to-day 20s. 10d.

COMPARATIVE COSTS OF STEAM, GAS, OIL, AND ELECTRICITY FOR POWER PURPOSES.

	Hourly Costs of Producing 20 B.H.P.
(*a*) *Steam.* Basis of calculation: Steam coal, 5 lbs. per B.H.P. per hour. Coal at nominal price of (say) 45s. per ton. Water, 37·5 lbs. (or, 3·75 gallons) per B.H.P. per hour. Water rate, 9½d. per 1000 gallons. Lubricating oil, 0·02 pint per B.H.P. per hour. Oil at 5s. 6d. per gallon. Labour, 20s. (one man, part time) per week of (say) 48 hours.	2s. 9 1d., inclusive of coal, water, lubricating oil, and labour.
(*b*) *Gas* (*Town*). Basis of calculation, 10,000 B.Th.U. per B.H.P. per hour (full load). Gas at 13·2d. per therm, less 10 p.ct. rebate (11·88d.). Lubricating oil, 0·01 pint per B.H.P. per hour. Oil at 5s. 6d. per gallon.	2s. 1·4d., inclusive of fuel and lubricating oil, but exclusive of attendance.
(*c*) *Oil.* Basis of calculation, 0·75 pint per B.H.P. per hour. Fuel oil at 2s. 3d. per gallon. Lubricating oil, 0·01 pint per B.H.P. per hour. Lubricating oil at 5s. 6d. per gallon.	4s. 4½d., inclusive of fuel and lubricating oil, but exclusive of attendance.
(*d*) *Electricity.* Basis of Calculation:	
(1) 880 watts per B.H.P. per hour. Electricity at 2d. per unit. Lubrication costs, 1d. per hour.	3s. 0·2d., inclusive of current and lubricating oil, but exclusive of attendance.
(2) 880 watts per B.H.P. per hour. Electricity at 2½d. per unit. Lubrication costs, 1d. per hour.	3s. 9d. do. do.

SOME FACTS IN CONNECTION WITH WATER HEATING.

Geyser.

The approximate cost of obtaining a 20-gallon bath by a geyser, allowing 940 heat units, or 0·0094 therms, per gallon of water (basis of calculation, 2 c.ft. per gallon), is 2½d. Gas at 13·2d. per therm.

Expressed in another way, 1 therm will raise 106 gallons (approx.) of water to "bath" temperature (100° Fahr.).

Time taken by a large geyser to produce 20 gallons at bath temperature, 10 minutes (approx.).

Time taken by a small geyser to produce 20 gallons at bath temperature, 15 minutes (approx.).

Circulating Boiler.

The approximate cost of obtaining a 20-gallon bath by a circulating boiler, allowing 1410 heat units, or 0·0141 therms, per gallon of water (basis of calculation 3 c.ft. per gallon), is 3¾d. Gas at 13·2d. per therm.

Expressed in another way, 1 therm will raise 71 gallons (approx.) of water to bath temperature.

Time taken by a large boiler to produce 20 gallons at bath temperature, 45 minutes.

Time taken by a small boiler to produce 20 gallons at bath temperature, 75 minutes.

This is, approximately, 1½d. more than by a geyser; but it must be borne in mind that the geyser is a "one-point" apparatus—*i.e.*, it supplies hot water to the bath only—whereas the boiler stores hot water in its cylinder or tank, which can be drawn off at any time, and at any desired points (bath, lavatory-basin, sink, &c.).

COMPARATIVE RUNNING COSTS OF GAS-HEATED AND SOLID-FUEL COPPERS.

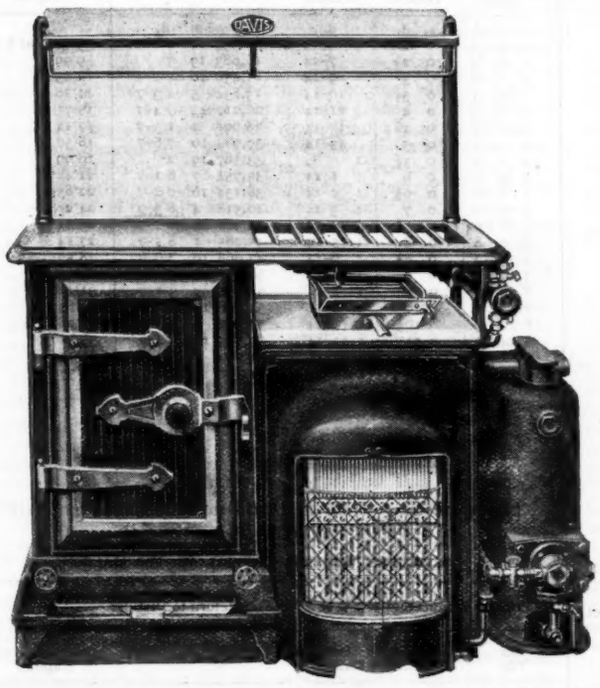
Actual tests have shown that a gas-heated copper is the most economical; and appended is a copy of one of these tests.

One week's washing for two adults and three children required 0·3 therms (basis of calculation 64 c.ft. of gas). 0·3 therm at 13·2d. per therm = 3·9d.

One week's washing for the same household required 16¾ lbs. of coal.

16¾ lbs. of coal at (say) 60s. per ton = 5·38d. (excluding wood and paper used in lighting copper fire).

Another test showed that one week's washing for two adults and six children required slightly under 1 therm (200 c.ft.).



THE "GREENOCK" COMBINATION INSTALLATION.

ALL-GAS kitchen installations are becoming increasingly popular, and will certainly continue to do so with the growth of housing schemes and the general desire for cleanliness and convenience in cooking and heating.

To the equipment available for this purpose the Davis Gas-Stove Company, Ltd., have added an excellent set, named the "Greenock," that provides the complete facilities which a coal-range is capable of offering. It is a high-grade and compact installation, comprising a "Davis" No. 109 gas-cooker, on feet so as to obviate stooping, and fitted with a hot-plate at the side; a "Diana" gas-fire under the hot-plate, provided with a brass-wire dress-guard; an "Auto-Economic" circulating boiler, with a thermostatic valve, to stand beside the fire; and over the cooker and hot-plate a rack with white enamelled back. On the hot-plate are two boiling burners and a simmering burner, together with a combination grilling and boiling burner. The products of combustion of the fire and circulator are carried away by means of a combined flue outlet. A No. 1 circulating boiler is specified for the set; but the size can be varied to suit requirements. Altogether it is an equipment that may be relied upon to last long, and prove a source of satisfaction to the housewife.

Koppers Oven for Small Gas-Works.

In a paper submitted to the Illinois (U.S.) Gas Association, Mr. Angus MacArthur, of the Koppers Company, Pittsburgh, described a small oven which has been designed to meet the needs of gas companies whose daily output is not large enough to warrant the installation of a battery of full-sized ovens. The reduction in size has been effected by shortening the oven from 37 ft. to 19 ft. The regenerators below the oven are standard, except as to length. There is, however, only one waste-gas flue; and the fuel gas is supplied from one side only. Essentially, the plant consists of chambers containing from 6·5 tons to 7·6 tons of coal; and the chambers are heated with producer gas made in outside mechanical producers. Throughout the plant mechanical means are, wherever possible, used to reduce the labour needed. Coke is pushed from the ovens on to a coke wharf, and is there quenched. The battery is built out in the open. The author said he had been told recently by the Vice-President of one of the largest gas companies in the United States, operating both coke-ovens and retort-houses, that the coke made by the ovens would net to his Company $1·5 per ton more than the coke made in the retort-house. This was the case if the same coal were used in each, and with all the other conditions the same. Further, the marketing of bye-product oven coke caused very much less trouble to his company. Bye-product coke, having a greater density, weighed from 15 to 30 p.ct. more than retort-house coke on the same moisture basis, and made a more valuable fuel for water-gas generators. As domestic fuel, it compared favourably with anthracite coal, and was preferred to it by many people who had used both. The tar from the ovens was of a superior quality, containing less free carbon and water, and more of the valuable tar oils and acids, than the usual retort-house tar. The producer plant to heat the ovens consumes by weight, in the form of the small coke, from 240 lbs. to 280 lbs. of coke per ton of coal carbonized. The producer gas is cooled and cleaned before going to the ovens, and the heat recovered by raising steam sufficient to operate the producers and cleaning machinery.

CO-OPERATIVE TAR SCHEMES.

A Comparison.

Arising out of the references on pp. 140, 142 of last week's "Journal" to co-operative tar schemes, and the statement that the Commercial Section of the Manchester District Institution of Gas Engineers had drawn-up an alternative scheme which is said to give greater benefits to the tar producer than any other collective scheme which has been published, the accompanying series of tables have been forwarded to us, in order that it may be possible to make a comparison of the various schemes. These tables, which are based on reasonable figures, representing capital per gallon of tar dealt with in each case, were drawn-up by Mr. Ernest Parry (the Secretary of the Lancashire Commercial Section of the Manchester Institution); and at the negotiations, the one marked "Alternative B" was accepted. That marked "Distillers' Scheme" is the one which was accepted by the Birmingham District. There are also tables based on an assumed capital of 5d. and 6d. per gallon of tar dealt with.

The remaining set of figures shows at a glance the return on capital to distillers under Alternative Scheme B, the National Gas Council scheme, and the Birmingham scheme. This includes the guaranteed 6 p.ct. return on capital, which is a feature of both the Birmingham and the Manchester schemes.

Table *Showing Profit to Distillers when Producers Receive Various Prices.*

Alternative Scheme A.

Price to Producer. Per Ton.	Price to Producer. Per Gallon.	Return to Distiller. Per Gallon.	Return to Distiller. Gross.	Percentage on Capital.
£ s. d.	s. d.	d.	£ s. d.	
1 11 8	0 2	..	..	*plus* 6 p.ct.
1 19 7	0 2½	1-40	834 3 11¾	'69 ,,
2 7 6	0 3	2-40	1,668 7 11½	1'39 ,,
2 15 5	0 3½	3-40	2,502 11 11¼	2'08 ,,
3 3 4	0 4	4-40	3,336 15 11	2'78 ,,
3 11 3	0 4½	5-40	4,170 19 10¾	3'47 ,,
3 19 2	0 5	6-40	5,005 3 10½	4'17 ,,
4 7 1	0 5½	7-40	5,839 7 10¼	4'86 ,,
4 15 0	0 6	8-40	6,673 11 10	5'56 ,,
5 2 11	0 6½	9-40	7,507 15 9¾	6'25 ,,
5 10 10	0 7	10-40	8,341 19 9½	6'95 ,,
5 18 9	0 7½	11-40	9,176 3 9¼	7'64 ,,
6 6 8	0 8	12-40	10,010 7 9	8'34 ,,
6 14 7	0 8½	13-40	10,844 11 8¾	9'03 ,,
7 2 6	0 9	14-40	11,678 15 8½	9'73 ,,
7 10 5	0 9½	15-40	12,512 19 8¼	10'42 ,,
7 18 4	0 10	16-40	13,347 3 8	11'12 ,,
8 6 3	0 10½	17-40	14,181 7 7¾	11'81 ,,
8 14 2	0 11	18-40	15,015 11 7½	12'51 ,,
9 2 1	0 11½	19-40	15,849 15 7¼	13'20 ,,
9 10 0	1 0	20-40	16,683 19 7	13'90 ,,
9 17 11	1 0½	21-40	17,518 3 6¾	14'59 ,,
10 5 10	1 1	22-40	18,352 7 6½	15'29 ,,
10 13 9	1 1½	23-40	19,186 11 6¼	15'98 ,,
11 1 8	1 2	24-40	20,020 15 6	16'68 ,,
11 9 7	1 2½	25-40	20,854 19 5¾	17'37 ,,
11 17 6	1 3	26-40	21,689 3 5½	18'07 ,,

Gallons, 8,008,310. Capital, £120,000.

Table *Showing Profit to Distillers when Producers Receive Various Prices.*

Alternative Scheme B.

Price to Producer. Per Ton.	Price to Producer. Per Gallon.	Return to Distiller. Per Gallon.	Return to Distiller. Gross.	Percentage on Capital.
£ s. d.	s. d.	d.	£ s. d.	
1 11 8	0 2	..	..	*plus* 6 p.ct.
1 19 7	0 2½	1-20	1,668 7 11½	1'39 ,,
2 7 6	0 3	2-20	3,336 15 11	2'78 ,,
2 15 5	0 3½	3-20	5,005 3 10½	4'17 ,,
3 3 4	0 4	4-20	6,673 11 10	5'56 ,,
3 11 3	0 4½	5-20	8,341 19 9½	6'95 ,,
3 19 2	0 5	21-80	8,759 1 9⅜	7'29 ,,
4 7 1	0 5½	22-80	9,176 3 9¼	7'64 ,,
4 15 0	0 6	23-80	9,593 5 9⅛	7'99 ,,
5 2 11	0 6½	24-80	10,010 7 9	8'34 ,,
5 10 10	0 7	25-80	10,427 9 8⅞	8'68 ,,
5 18 9	0 7½	26-80	10,844 11 8¾	9'03 ,,
6 6 8	0 8	27-80	11,261 13 8⅝	9'38 ,,
6 14 7	0 8½	28-80	11,678 15 8½	9'73 ,,
7 2 6	0 9	29-80	12,095 17 8⅜	10'07 ,,
7 10 5	0 9½	30-80	12,512 19 8¼	10'42 ,,
7 18 4	0 10	16-40	13,347 3 8	11'12 ,,
8 6 3	0 10½	17-40	14,181 7 7⅞	11'81 ,,
8 14 2	0 11	18-40	15,015 11 7¾	12'51 ,,
9 2 1	0 11½	19-40	15,849 15 7⅝	13'20 ,,
9 10 0	1 0	20-40	16,683 19 7	13'90 ,,
9 17 11	1 0½	21-40	17,518 3 6¾	14'59 ,,
10 5 10	1 1	22-40	18,352 7 6½	15'29 ,,
10 13 9	1 1½	23-40	19,186 11 6¼	15'98 ,,
11 1 8	1 2	24-40	20,020 15 6	16'68 ,,
11 9 7	1 2½	25-40	20,854 19 5¾	17'37 ,,
11 17 6	1 3	26-40	21,689 3 5½	18'07 ,,

Table *Showing Profit to Distillers when Producers Receive Various Prices.*

Distillers' Scheme.

Price to Producer. Per Ton.	Price to Producer. Per Gallon.	Return to Distiller. Per Gallon.	Return to Distiller. Gross.	Percentage on Capital.
£ s. d.	d.	d.	£ s. d.	
1 11 8	2	4-14	9,533 14 0 4-7	7'9 *plus* 6 p.ct.
1 19 7	2½	7-14	16,683 19 7	13'9 ,,
2 7 6	3	9-14	21,450 16 7 2-7	17'8 ,,
2 15 5	3½	10-14	23,834 5 1 3-7	19'8 ,,
3 3 4	4	11-14	26,217 13 7 4-7	21'8 ,,
3 11 3	4½	12-14	28,601 2 1 5-7	23'8 ,,
3 19 2	5	13-14	30,984 10 7 6-7	25'8 ,,
4 7 1	5½	1	33,367 19 2	27'8 ,,
4 15 0	6	1 1-14	35,751 7 8 1-7	29'7 ,,
5 2 11	6½	1 2-14	38,134 16 2 2-7	31'7 ,,
5 10 10	7	1 3-14	40,518 4 8 3-7	33'7 ,,
5 18 9	7½	1 4-14	42,901 13 2 4-7	35'7 ,,
6 6 8	8	1 5-14	45,285 1 8 5-7	37'7 ,,
6 14 7	8½	1 6-14	47,668 10 2 6-7	39'7 ,,
7 2 6	9	1 7-14	50,051 18 9	41'7 ,,
7 10 5	9½	1 8-14	52,435 7 3 1-7	43'6 ,,
7 18 4	10	1 9-14	54,818 15 9 2-7	45'6 ,,
8 6 3	10½	1 10-14	57,202 4 3 3-7	47'6 ,,
8 14 2	11	1 11-14	59,585 12 9 4-7	49'6 ,,

Gallons, 8,008,310. Capital, £120,000.

Table *Showing Profit to Distillers when Producers Receive Various Prices.*

Distillers' Scheme—Capital 5d. per Gallon.

Price to Producer. Per Ton.	Price to Producer. Per Gallon.	Return to Distiller. Per Gallon.	Return to Distiller. Gross.	Percentage on Capital.
£ s. d.	s. d.	d.	£ s. d.	
1 11 8	0 2	4-14	9,533 14 0 4-7	5'71 *plus* 6 p.ct.
1 19 7	0 2½	7-14	16,683 19 7	9'99 ,,
2 7 6	0 3	9-14	21,450 16 7 2-7	12'85 ,,
2 15 5	0 3½	10-14	23,834 5 1 3-7	14'28 ,,
3 3 4	0 4	11-14	26,217 13 7 4-7	15'71 ,,
3 11 3	0 4½	12-14	28,601 2 1 5-7	17'14 ,,
3 19 2	0 5	13-14	30,984 10 7 6-7	18'57 ,,
4 7 1	0 5½	1	33,367 19 2	19'99 ,,
4 15 0	0 6	1 1-14	35,751 7 8 1-7	21'42 ,,
5 2 11	0 6½	1 2-14	38,134 16 2 2-7	22'85 ,,
5 10 10	0 7	1 3-14	40,518 4 8 3-7	24'28 ,,
5 18 9	0 7½	1 4-14	42,901 13 2 4-7	25'71 ,,
6 6 8	0 8	1 5-14	45,285 1 8 5-7	27'14 ,,
6 14 7	0 8½	1 6-14	47,668 10 2 6-7	28'57 ,,
7 2 6	0 9	1 7-14	50,051 18 9	29'99 ,,
7 10 5	0 9½	1 8-14	52,435 7 3 1-7	31'42 ,,
7 18 4	0 10	1 9-14	54,818 15 9 2-7	32'85 ,,
8 6 3	0 10½	1 10-14	57,202 4 3 3-7	34'28 ,,
8 14 2	0 11	1 11-14	59,585 12 9 4-7	35'71 ,,
9 2 1	0 11½	1 12-14	61,969 1 3 5-7	37'14 ,,
9 10 0	1 0	1 13-14	64,352 9 9 6-7	38'57 ,,

Table *Showing Profit to Distillers when Producers Receive Various Prices.*

Distillers' Scheme—Capital 6d. per Gallon.

Price to Producer. Per Ton.	Price to Producer. Per Gallon.	Return to Distiller. Per Gallon.	Return to Distiller. Gross.	Percentage on Capital.
£ s. d.	s. d.	d.	£ s. d.	
1 11 8	0 2	4-14	9,533 14 0 4-7	4'76 *plus* 6 p.ct.
1 19 7	0 2½	7-14	16,683 19 7	8'33 ,,
2 7 6	0 3	9-14	21,490 16 7 2-7	10'71 ,,
2 15 5	0 3½	10-14	23,834 5 1 3-7	11'90 ,,
3 3 4	0 4	11-14	26,217 13 7 4-7	13'09 ,,
3 11 3	0 4½	12-14	28,601 2 1 5-7	14'28 ,,
3 19 2	0 5	13-14	30,984 10 7 6-7	15'47 ,,
4 7 1	0 5½	1	33,367 19 2	16'66 ,,
4 15 0	0 6	1 1-14	35,751 7 8 1-7	17'85 ,,
5 2 11	0 6½	1 2-14	38,134 16 2 2-7	19'04 ,,
5 10 10	0 7	1 3-14	40,518 4 8 3-7	20'23 ,,
5 18 9	0 7½	1 4-14	42,901 13 2 4-7	21'42 ,,
6 6 8	0 8	1 5-14	45,285 1 8 5-7	22'61 ,,
6 14 7	0 8½	1 6-14	47,668 10 2 6-7	23'80 ,,
7 2 6	0 9	1 7-14	50,051 18 9	24'99 ,,
7 10 5	0 9½	1 8-14	52,435 7 3 1-7	26'19 ,,
7 18 4	0 10	1 9-14	54,818 15 9 2-7	27'38 ,,
8 6 3	0 10½	1 10-14	57,202 4 3 3-7	28'57 ,,
8 14 2	0 11	1 11-14	59,585 12 9 4-7	29'76 ,,
9 2 1	0 11½	1 12-14	61,960 1 3 5-7	30'95 ,,
9 10 0	1 0	1 13-14	64,352 9 9 6-7	32'14 ,,

Comparison of Schemes, Using Actual Capital and Gallonage Dealt With.

Alternative Scheme B.		National Gas Council Scheme.		Birmingham Scheme.	
Price to Producer. Per Gallon.	Percentage to Distiller on Capital.	Price to Producer. Per Gallon.	Percentage to Distiller on Capital.	Price to Producer. Per Gallon.	Percentage to Distiller on Capital.
s. d.		d.		d.	
0 2	8	1·67	9·17	2	15·9
0 2·5	9·39	2·0625	12·16	2·5	21·9
0 3	10·78	2·469	14·76	3	25·8
0 3·5	12·17	2 8735	17·42	3·5	27·8
0 4	13·56	3·276	20·13	4	29·8
0 4·5	14·95	3·5775	25·65	4·5	31·8
0 5	15·29	3·9750	28·50	5	33·8
0 5·5	15·64	4·3725	31·35	5·5	35·8
0 6	15·99	4·7700	34·20	6	37·7
0 6·5	16·34	5·1675	37·05	6·5	39·7
0 7	16·68	5·5650	39·90	7	41·7
0 7·5	17·03	5·9625	42·75	7 5	43·7
0 8	17 38	6·3600	45·60	8	45·7
0 8·5	17·73	6·7575	48·45	8·5	47 7
0 9	18·07	7·1550	51·30	9	49·7
0 9·5	18·42	7·5525	54·15	9·5	51·6
0 10	19·12	7·9500	57·00	10	53·6
0 10·5	19·81	8·3475	59·85	10·5	55·6
0 11	20·51	8·7450	62·70	11	57·6
0 11·5	21·20	9·1425	65 55	..	..
1 0	21·90	9·5400	68·40	..	..
1 0·5	22·59	9·9375	71·25	..	..
1 1	23·29	10·3350	74·10	..	..
1 1·5	23·98	10·7325	76·95	..	..
1 2	24·68	11·1300	79·80	..	..
1 2·5	25·37	11·5275	82·65	..	..
1 3	26·07	11·9250	85·50	..	..

SIXTY YEARS AGO.

[From the "Journal" for April, 1861.]

Retort Charges in Cradles.—Writing on this subject, Mr. J. T. B. Porter, of John Street, Adelphi, said: My attention has been called to the abstract of a specification of a patent granted to Mr. James Hansor for "Improvements in the Manufacture of Coal Gas," wherein it states that the retorts are "charged with coal, placed in separate vessels, which are called cradles, in such a manner that the coals do not come in contact with the retorts in which the cradles charged with coal are placed." This plan of charging retorts was used by me more than a year since, and I have manufactured apparatus which allows of its adoption; but, after repeated trials, I did not think that it possessed any superiority over other modes of charging the retort, or that it was sufficiently novel to claim a patent protection.

Gas Supply of Glasgow.—The gas movement in Glasgow seems likely to come to an amicable settlement. Scotchmen, though somewhat apt to be misled by the temptation of great gains, are generally too shrewd to be taken far astray; and they will scrutinize well the characters and motives of those who undertake to guide them, before they get too far to return. Mr. Flintoff's project for the formation of a Glasgow Consumers' Company, in shares of £1, with sixpenny deposits, to supply 30-candle gas for 3s. 6d. per 1000 c.ft., has not been received so eagerly as he might have desired. The consideration of the plans was submitted by the Town Council to a Committee, who made their report at the ordinary monthly meeting of the Council. It appears from their report that the Committee were favoured with the volunteered assistance of Mr. Samuel Hughes, and that they had also the advantage of the opinion of Mr. John Cox, who had been engaged by the projected Consumers' Company to make a report on the gas supply of Glasgow. Mr. Hughes's expectations of a job in that quarter were, however, disappointed; all that he seems to have obtained being favourable mention by the Committee. Mr. Cox, who was employed on the Flintoff interest, is known as the projector of a new Liverpool Gas Company in 1847, at the time when there were two competing Companies in the town; but, contrary to his expectation, the dread of having the streets broken open to lay-down the mains of a new Company urged the Corporation to force the two existing Companies to unite and expel the intruder. The effect of the amalgamation, as is well known, has been the reduction of the price of gas, and the payment of dividends of 10 p.ct. to the shareholders.

Cathedral, church, and hall lighting is dealt with at length, by the aid of a series of first-rate photographs, in the latest issue of the British Commercial Gas Association's "Thousand-and-One Uses for Gas." Examples of the most appropriate styles of lighting are illustrated, and details of the installations are furnished.

Sand-lime bricks, which do not disintegrate in frost, resist acid fumes, and are suitable for chemical works and chimney stacks, form, together with cement-concrete bricks, the subject of Special Report No. 1 of the Building Research Board, published at the price of 3d. net by H.M. Stationery Office, for the Department of Scientific and Industrial Research. The author is Mr. H. O. Weller, B.Sc., M.Inst.C.E., Director of Building Research.

THE CASE FOR A SERVICE CHARGE.

Mr. Chas H. Nettleton, the President of the New Haven (Conn.) Gas Light Company, giving evidence during a recent hearing on Bills which would prohibit gas companies making meter and service charges, said that the small consumers generally consisted of occupants of offices whose lighting hours were limited; of occupants of all those places where a gas-meter was kept in reserve, so that gas could be used when the electric light failed; of persons who used a little gas to light their halls; and of theatres which employed it to illuminate their exits. These accounted for far more of the small consumers than did poor persons. A service charge, which was known also as a readiness-to-serve or customer charge, covered part of the cost of maintaining a gas installation connected to a system of mains with an adequate gas supply ready for use. It also included the cost of meter reading, office work, complaints, and other expenses borne by the company independent of whether much, little, or no gas be used. When not enough gas was consumed by one customer to pay these costs *plus* the cost of the gas itself, the difference, or loss, had to be met by other customers in the price that they paid for gas.

Investigation showed that a large number of their installations used little or no gas. The Company had 11,000 meters, through each of which for the year there passed an average of 1000 c.ft. This represented about $1·1 per annum; whereas adding together all the items properly grouped as service charges showed a total average yearly cost to the Company of over $10 per meter. Equity and justice therefore demanded the adoption of a service charge, which amounted generally to only $6 per meter per annum. Last year the gas cost the Company 90 c. per 1000 c.ft.; so that on each of these meters they made a profit of 20 c. As the cost of maintaining the supply and being ready to serve with gas amounted to more than $10 per annum for each consumer, some one had to pay the difference of $9·8. It was a matter of fact that 10 p.ct. of the consumers used 40 p.ct. of the gas; and they furnished the most profitable business of the Company. These consumers had borne more than their fair share of the total expenses, and would continue to do so with the service charge in effect. A flat increase in the price of gas equivalent in return to the service charge would restrict the large users, and drive them to other fuels; and the result would be reflected in still higher prices to all the consumers. Besides conditions of fairness, therefore, the advantage of the consumers as a whole was best served by the adoption of the service charge. Since August last, when the service charge was started, his Company had lost over 2000 meters, mostly because they were not worth to the consumer the monthly service charge. If 1500 of the meters had been removed for this reason, Mr. Nettleton estimated that the Company would save at least $12,000 a year; and this loss had been borne by the other consumers.

A Welded Steel Pipe-Line.

There has recently been completed by the Midway Gas Company, of Taft, California, the welding of 18½ miles of 10-inch natural gas pipe-line. The line goes practically straight across country, and has very few bends in it. The temperature variations are always considerable during the day; and altogether the welders had to contend, not only with the ordinary difficulties of contraction and expansion, but with operating obstacles of an unusual nature. Welding crews were stationed at successive stages of the work; and oxygen and acetylene tanks were moved from one joint to the next on improvized sledges drawn by mules. The pipe of 10 in. inside diameter, weighing 27·37 lbs. per linear foot, with sections averaging 35 ft. long, was delivered already bevelled to 45° at the ends—the bevels carrying through to the base or inside circumference of the tube. The trench for the pipe was excavated under contract with a machine trencher, and was 2 ft. in width and 3 ft. deep. Twenty lengths of pipe were assigned as the operating unit for each welding crew. The pipe was laid at the side of the trench, and rested on skids; the crews welding the joints successively, rolling the pipe into place, and turning it as the work progressed to keep it horizontal. When a series of twenty sections was welded, the completed work was rolled on the skids until directly over the trench, and lined-up with the preceding series by means of chains and tongs. If it was found that the two twenty-section lengths overlapped, the overlap was cut away, and the abutting ends welded. Where there was a gap instead of an overlap, the space was filled by welding-in a short section of the right length. During the actual welding, expansion and contraction of the pipe, due to atmospheric changes, were ignored, excepting when tying-in the twenty-length sections. The welding of the latter was always done in the cool of the morning, to avoid any possibility of contractional ruptures. This was necessary because, while expansion would take care of itself in effecting slight undulations in the line, without this provision for up-take, contraction tension might result in a break where, as in this case, the extreme variations in section lengths at different hours of the day sometimes amounted to as much as 6 in. or 8 in. For this reason, also, the pipe was lowered into the trench only at the coldest periods of the day. In the entire 18½ miles there were but three or four defective welds that had to be repaired with the torch, or approximately one to every thousand welds.

AN AMERICAN GAS PURIFICATION INVESTIGATION.

By W. A. Dunkley and C. E. Barnes.

(*Continued from p.* 150.)

Quality of Oxide for Gas Purification.

The quality of oxide used for purifying gas is another factor affecting efficiency and economy of purification; but this has not as yet been worked out so that it can be expressed mathematically in computing the performance of a given equipment. Some research work, having as its object the determination of the effects of the peculiar properties of various oxides, is now in progress; and it is hoped to throw some light on the subject in a later publication. At the present time it is recognized that oxides produced by different processes, and indeed even oxides made by the same process, show variations in performance; but just what are the causes of these variations and how they can be controlled is not now known.

Types of Hydrated Iron Oxides.

Three main types of hydrated oxide of iron are in use for purification. These include:

(1) Oxides made by rusting cast-iron borings in the air with water only, or with accelerating agents such as sulphate of iron, salt, &c.

(2) Natural oxides, which include certain ores having the proper chemical and physical condition.

(3) Precipitated oxides, made by the chemical precipitation of hydrated oxides of iron from the salts of iron produced as by-products in certain industries or from the iron-bearing water of some mines.

Each of these oxides has properties peculiar to itself, the reasons for which are not yet clear. While ferric oxide (Fe_2O_3) is included in the composition of each as the reacting material, the presence of other materials in combination with it, and the physical structure of the material, are of the greatest importance in determining performance. Ferric oxide by itself without water of hydration is almost or entirely non-reactive with hydrogen sulphide.

Formerly the iron content of a commercial material was considered as an index to its value for purifying gas. While this may be true to a limited degree when applied to oxides of one type, it does not hold in comparing oxides of different types.

Tests of Oxides.

Since the absorption of hydrogen sulphide is the main thing desired from the oxide, it follows that tests which will indicate the absorbing value of a particular oxide are the most logical ones to apply in valuing a material. Such tests have been devised; but no test which has yet been suggested is sufficiently definite in its provisions, and indicative of the results to be obtained in actual practice, thoroughly to meet the requirements of a standard test. This is evidenced by the fact that the Purification Committee of the American Gas Association is now endeavouring to devise such a standard test, that will meet the requirements of the gas industry generally.

One of the simplest and best-known laboratory tests worked out thus far is that of A. F. Kunberger [see Appendix B]. In the Kunberger method, a small weighed sample of oxide is fouled by dry hydrogen sulphide for one hour; the water liberated by the reaction being retained in a tube containing granulated fused calcium chloride, which is weighed with the tube containing the oxide before and after fouling. The gain in weight of the two tubes (or one tube containing both oxide and calcium chloride may be used) is equal to the weight of H_2S absorbed. Such a test is very useful in determining the relative capacities of various materials under the conditions of the test. The test is also said by some operators to check practical operations quite closely. Other operators, however, place less reliance on it, and in purchasing an oxide of unknown quality are not satisfied with anything less than a semi-commercial test. Such a test usually consists in fouling two oxides—one of known practical performance, the other the unknown material—with unpurified gas, in a pair of small purifiers. These purifiers may contain from a few quarts to a few bushels of the materials in one or more layers. Sometimes two sets of two or more purifiers each are used. The purifiers are followed by gas-meters to measure the gas passing through each oxide. The test usually consists in passing gas through both materials at the same rate, and noting the volume of gas purified by each, until the time when some hydrogen sulphide passes one material—as shown by a test with lead acetate paper at the outlet. The rate of gas flow at the beginning of the test is generally at least twice that usual in practice. Sometimes when one material begins to pass hydrogen sulphide, the rate of flow is reduced until absorption is complete and the test continued at the new rate until H_2S again passes the material. The test may be continued until both materials are entirely fouled; and in some cases the materials after revivification are tested again. Such a test would seem to possess advantages over a strictly laboratory test, since the same kind of gas is used that has to be purified in the works purifiers, and the rate of fouling is nearer that obtaining in practice. On the other hand, in small test installations where the surface of contact between the oxide and the box is usually relatively much greater than in practice, there is danger of the gas passing up the sides of the box to a considerable extent, and the excessive rates of purification are likely to cause channelling. Another disadvantage of tests of this kind is the time required to complete them. With rates of fouling approaching those in practice, weeks or even months may be required to foul the materials.

In all tests of oxides, the great difficulty is to interpret the results fairly and with certainty. At present those gas companies who make extensive tests on oxides interpret the tests as best they can in accordance with their own particular conditions and the opinions of their own engineers, and until a standard test with carefully specified equipment and testing procedure is worked out, it will be very difficult properly to evaluate commercial purifying materials.

Activity and Capacity of Oxides.

The existing overloaded condition of the purifying apparatus in many gas-plants necessitates more attention to the activity or speed of oxides than has hitherto been given to the subject. A satisfactory test must indicate the relative activity of the materials under test. At the same time, the capacity of oxides will remain an important consideration. The Steere formula allows about 6 minutes contact of gas with oxide, assuming all the space occupied by the oxide to be free space. The actual free space in a layer of oxide will, of course, be considerably less than the total volume, depending on the coarseness of the material—a factor which is continually changing as the material is used and becomes more and more clogged with sulphur. A new oxide sponge might have 60 to 70 p.ct. of free space, and therefore the actual time of contact would be considerably less than 6 minutes, as mentioned above. If, as is sometimes the case, the time of contact in a heavily loaded purifying system is reduced to 2 minutes or less, it is evident that the rapidity of the material may have a very important bearing on its value for such a plant. It is quite likely that various factors could be worked-out applying to various types of purifying oxides, which, introduced into formulas for purifying capacities, would materially alter the hourly capacities permissible with an equipment of given size and arrangement. This subject needs further study. Computations will for the present purpose be made, assuming that all oxides are the same. In drawing conclusions and suggesting remedies for certain cases, the possibility of using more rapid oxides must be borne in mind.

Conditions found in Illinois Plants.

As mentioned earlier in this bulletin, sixteen of the medium-sized plants of the State were visited. Information was gathered relative to load conditions, size and kind of equipment, operating methods, and to a certain extent, the results obtained. This latter information was supplemented by the results of analyses of spent oxide samples collected in the various plants.

Upon returning to headquarters the information obtained was tabulated, purifier capacities were computed, oxide samples were analyzed, and results tabulated. Half the plants visited were mixed-gas plants. Their problems were somewhat different from those of straight water gas plants, so the data and results have been tabulated separately. In accordance with an oral agreement under which the results were obtained, the tabulations contain no plant names.

Equipment Conditions.

The purifying equipment conditions in Illinois plants are probably the same as those existing in similar plants elsewhere. There is the usual combination of old and new equipment which results from piecemeal construction. The old equipment has often been outgrown, but in many cases is still serviceable; and the usual policy has been to increase capacity by adding another purifier, usually of the outdoor type, to the older indoor equipment, retaining the latter in service. Such a condition exists in about half the plants inspected.

While it is of course advantageous to get as much economical service as possible from a given unit of equipment, it appears in some cases that the old equipment is a drag on the new. In making additions in some cases, the minimum cost of the addition has been looked after, rather than operating economy. The connections are so arranged as to permit both the old and the new equipment to be used at the same time, but with little regard to the flexibility of the system. The arrangement is often so fixed as to permit only one order of the boxes in series. In some cases there is a certain latitude for arrangement among the old units, but usually the new equipment either precedes or follows the old in a fixed position relative to it. Most of the new purifiers are equipped for deep layers of oxide and valved for reversible flow, whereas most of the old boxes have shallow oxide layers and straight flow. In no case which we recall is there a combination of old and new equipment in use, provided with arrangements for perfect flexibility as to rotation of boxes and reversibility of flow. In about half the plants are the boxes uniform as to size and type and completely flexible as to arrangement.

The computation of purifier capacity for many of the plants is a rather complicated matter. The Steere formula is applicable primarily to boxes arranged for reversible flow, though the formula can be applied to straight-flow boxes by the use of an appropriate factor. In some plants where there is a combination of reversible and straight-flow boxes, it is necessary to use one's judgment in the selection of the proper factor, and opinions of two engineers might differ as to the proper value of the factor to be taken.

[There follows a brief description of the purifying equipment of the various plants inspected, together with remarks relative to special conditions.]

Rearrangement of Equipment to Increase Capacity.

The capacity of a purifying installation may sometimes be materially increased by minor changes whereby the existing equipment can be used in a more advantageous way, or the existing equipment may be enlarged, without changing its position or increasing the ground space occupied. Again, internal changes are possible whereby the purifiers may be made to accommodate a greater volume of oxide. Frequently, where the existing equipment is in good condition, such changes may be made at a fraction of the cost of an entirely new installation. Where additional capacity is needed, it would often pay to consider (*a*) whether the best possible performance is being obtained from the present equipment, and (*b*) whether some minor changes would not secure sufficient additional capacity to defer the installation of new equipment. Of course, in this as in any other construction, there is always some uncertainty as to the relative cost of installation now or a few years hence.

In the first place, it may be well to consider whether the amount of oxide is the maximum that the boxes will accommodate or whether the layers are of the greatest thickness permissible. In several instances it was found that the space available for oxide in the boxes, even allowing for the trays and a reasonable amount of free space, was considerably greater than would correspond to the number of bushels said to have been purchased for the boxes. Again, the amount of free space allowed may be excessive. In some cases the trays could be relocated without unduly diminishing the free space and with a distinct increase in capacity. Take, for example, a four-box set of purifiers arranged for reversible flow, each box 15 ft. in diameter and 12 ft. high, containing two layers of oxide, each 4 ft. 6 in. in depth. The hourly capacity, according to the Steere formula, would be 61,845 c.ft., if the gas contained 200 grains of sulphuretted hydrogen per 100 c.ft. Now, assuming that the depth of each layer could be increased by 6 in., the capacity would become 66,262 c.ft.—an increased capacity of 14 p.ct.

If the space available for oxide is being utilized to the fullest extent, then rearrangement may be in order. As has been suggested in several cases, reversible flow may help considerably. Let us assume an installation of three rectangular boxes, each 25 by 25 by 12 ft., containing two 5-ft. layers of oxide equipped for straight flow only, and with a given sequence as ABC, BCA, CAB. Such an installation purifying gas containing 200 grains of sulphuretted hydrogen per 100 c.ft. would have a maximum hourly capacity (Steere formula) of 133,000 c.ft. of gas. Let us assume that this installation is overloaded and that it is desired to increase its capacity about 35 p.ct. This increase may be accomplished in either of two ways—namely, by making the three existing purifiers perfectly flexible as to arrangement and reversibility or by installing a fourth box of the same size as the existing boxes, arranged for straight flow only. Leaving out of consideration for the present the difference in operating cost (which would be in favour of the former arrangement), let us consider the probable relative costs of the two arrangements. At present prices, the cost of a new box of the size given, arranged for straight flow only, would probably be somewhere between $12,000 and $16,000. The installation of three 6-in. reversing valves, together with the alteration of the manifold, whereby the three existing boxes could be made entirely flexible as to arrangement and reversibility, would cost somewhere between $6500 and $11,000, depending of course upon the amount of work and material that would be required and the amount of material from the old manifold that could be applied to the change. It is evident then that if the existing purifiers were in good condition and conveniently arranged for operation, rearrangement would be decidedly cheaper than the addition of another box of the same type. The economy of operation would also be distinctly in favour of rearrangement.

(*To be continued.*)

Hot Tar for Naphthalene Troubles.

Naphthalene has been troublesome in Peoria, so Mr. J. A. Brown explained to the Illinois Gas Association, for a number of years past. Recently many of the ordinary expedients for alleviating this trouble have been resorted to; but with alterations to the plant, it became necessary to clean-up all naphthalene deposits in existing mains. In research work carried out by the holders of the Gas Fellowship maintained by the Michigan Association it had been clearly indicated that hot tar would absorb and hold more naphthalene than cold tar. A scrubber was installed immediately at the outlet of the carbonizing chambers, and so arranged that the condensed tars and condensed liquor, or a mixture, might be over-pumped. Tests were made to determine the effect on the gas quality, and no appreciable loss in calorific value could be discovered. When the scrubbing was done with hot tar, there was obtained an almost complete absorption of the naphthalene from the gas. Based upon the results of this experience, a hot tar scrubber, 4 ft. diameter and 36 ft. high, was last year installed at Peoria; and since it has been in operation, gas has been sent out so completely free from naphthalene that the service complaints from this cause have decreased over one-third. Indications are that the older deposits are being cleaned-up, as shown by simultaneous tests for naphthalene carried out on the plant and in the distribution system. The tests out on the system will show naphthalene when the test at the plant remains clear.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

The Wandsworth, Wimbledon, and Epsom District Gas Bill: Read the third time, passed, and sent to the Commons.

The Stretford Gas Company have deposited a petition against alteration in the Manchester Corporation (General Powers) Bill.

HOUSE OF COMMONS.

Progress of Bills.

The Burnley Corporation Bill and the Leicester Corporation Bill: Reported, with amendments, from the Local Legislation Committee.

The South Metropolitan Gas Bill, as amended: Considered, read the third time, and passed.

The Colne Corporation Bill, as amended: Considered, amendments made, and to be read the third time.

The Wandsworth, Wimbledon, and Epsom District Gas Bill: Read the first time, and referred to the Examiners.

The Standing Orders not previously inquired into have been complied with in the case of the Nelson Corporation Bill. It was ordered to be read a second time.

Requisitions to withdraw petition have been made by the Rawtenstall Corporation and the Lancashire County Council against the Burnley Corporation Bill.

The Radcliffe and District Joint Gas Board Bill is to be considered by the following Committee: The Chairman of Ways and Means, the Deputy-Chairman, Commander Bellairs, Major Hayward, and Sir Ernest Moon.

Public Utility Companies (Capital Issues) Act, 1920.

Reports were presented on applications to the Board of Trade under the Act by the Brentwood Gas Company and the Dudley Gas Light Company.

Gas and Water Bills, Joint Committee.

Sir Samuel Roberts reported from the Committee of Selection the following four members had been nominated to serve on the Joint Committee of Lords and Commons on Gas and Water Bills: Lieut.-Col. Bell, Mr. Hood, Mr. Tyson Wilson, and Sir Alfred Yeo.

Sligo Gas-Works Coal Supply.

Mr. Myers, on Wednesday last, asked the Financial Secretary to the Treasury whether the Customs Authorities in Glasgow were holding-up a vessel laden with coal for the Sligo Gas Company. As all the principal industries in Sligo were dependent upon gas power and the Gas Company had only three days' supply, any further delay in releasing this vessel would have a serious effect.

Mr. Bridgeman (the Secretary for Mines), who replied, said that, upon the advice of the Government Departments charged with regulating the supply and distribution of coal in the present emergency, clearance had been refused to the steam collier "Girasol" at Glasgow, loaded with coal for the Sligo Gas Company, in view of the probability of more urgent needs arising elsewhere in the immediate future. The information in the hands of the Mines Department showed that at the commencement of the present emergency the Sligo Gas Company had sufficient coal in stock to last until about the beginning of last week. Through the intervention of the Mines Department the Company had since had a further supply of 100 tons, which, if consumption was restricted as in Great Britain, should last another week and a half or two weeks. It was further understood that in the Sligo district the stocks of the coal merchants averaged about three weeks' supply at the normal rate of consumption; and it should be possible for arrangements to be made locally for some of this coal to be used by the Gas Company. The matter would be kept under consideration.

Lighting Restrictions during the Coal Strike.

Viscount Curzon asked the Prime Minister whether the war lighting restrictions could be introduced for the duration of the present stoppage in the coal industry to ensure an economy in the use of fuel; and whether he was satisfied that the people as a whole were economizing sufficiently in the use of fuel in lighting, heat, and power generally.

Mr. Bridgeman, who replied, said the question whether the drastic restrictions on lighting adopted during the war should be re-imposed during the present emergency had been carefully considered; but he was of opinion that it would be inadvisable to adopt them in their entirety. He was not, however, satisfied that the present restrictions were in all cases being fully observed. It had, therefore, been found desirable to call the special attention of local authorities and public utility undertakings to the need for strict compliance with the directions already issued. If his noble friend was aware of specific cases of non-compliance with the directions, he should be glad to inquire into them.

HOUSE OF LORDS COMMITTEE.

TENDRING HUNDRED GAS AND WATER BILL.

Tuesday, April 19.

(*Before the* Marquis of Bristol, *Lord* Erskine, *Lord* O'Hagan, *Lord* Fairfax, *and Lord* Greville.)

This Bill proposes to amend the financial powers of the Tendring Hundred Water-Works Company under their existing Acts, to authorize new gas lands and a line of pipes, and to empower the Company to charge for gas upon the therm basis.

Counsel for the Bill were Mr. Clode, K.C., and Mr. Beveridge. The opponents, so far as the gas provisions of the Bill were con-

cerned, were the Frinton-on-Sea Urban District Council, represented by Mr. G. W. Bailey; the Tendring Urban District Council, represented by Mr. W. J. Jeeves, K.C., and Mr. Jacques Abady; and the Walton-on-the-Naze Urban District Council, represented by Mr. F. G. Thomas, K.C.

Mr. Clode, in opening, said that the Company had an area of supply for gas which included the urban districts of Walton and Frinton. The expenses of the undertaking had risen considerably during the last few years, and it was necessary to make some provision for the future. A revision clause had been inserted in the Bill, which provided that there should be a revision of prices in five years, on the application of the local authorities or the Company to the Board of Trade, and subsequent revision if necessary for each succeeding period of five years. The Company was incorporated by the Tendring Hundred Water-Works Act, 1884. Previously Mr. Peter Brough had undertaken to supply Harwich with water, and also had powers to supply water and gas in Walton and Frinton; and the Company was incorporated, generally speaking, to take over Mr. Brough's obligations in both directions. They were incorporated as a water company, with power to acquire the gas undertaking. The share capital of the company now stood at £250,000, of which £142,000 was in "A" shares, and £108,000 in "B" shares. In the first instance, the dividend on these shares was 4½ p.ct.; but in 1886 a limitation of 8 p.ct. was placed upon them, although, in point of fact, the dividend had never risen beyond 5½ p.ct. (in 1917), and for many years was considerably below this figure. Of the £142,000 "A" shares, £106,410 had been issued at a premium of £19, so that there still remained £35,571 of these shares unissued. Of the "B" shares, £52,450 had been issued; and £55,550 remained. The total unissued capital was therefore £91,121. By a Provisional Order in 1920 the Company had obtained borrowing powers of half the share capital issued and paid up; so that the borrowing powers of the Company at the present moment were to the extent of £79,440. Of this, £44,220 had been issued, leaving £35,220 unissued. As there was £91,121 of the share capital still unissued, the Company could not borrow the remaining £45,560. The total amount of money yet to be raised, therefore, was £171,901 in shares and loan; and it was the object of the Bill to enable this to be done upon different terms from those now imposed. The work which it was necessary should be carried out in connection with the undertaking had been estimated at £159,000, of which £87,000 was to be spent on the gas undertaking. The question facing the Company was how to make these powers available by putting them on the money market at a price which would attract the investor. Recently the Company had tried to raise £10,000 by the issue of redeemable debentures; but only £4670 was taken up. It was necessary, therefore, to be able to exercise their financial powers to the best advantage, and they were asking that they should be able to fix their own rate of dividend. Some of those who had objected said that when Parliament was asked to grant permission to issue preference shares, whether redeemable or ordinary preference shares, they should be asked to fix the limit of dividend; and he admitted that it had been the habit of Parliament in the past to fix the limit. Recently, however, the conclusion had been come to by some wiseacres that a fixed limit was an embarrassment, and that allowance should be made to meet the necessities of the market. The Bill asked for power to issue new ordinary shares at 10 p.ct. under the following conditions—viz., 4½ p.ct. was to be paid on the preferred ordinary, or "A," shares, 4½ p.ct. on the ordinary shares, and £5 12s. 6d. on the new ordinary shares. After these distributions were made there was to be a further distribution, according to the profits of the undertaking, of 3½ p.ct., 3½ p.ct., and £4 7s. 6d. respectively; so that the "A" and "B" shares would get their 8 p.ct., and, if there were enough profits, the new ordinary shares would get 10 p.ct. The revenue of the Company had remained stationary; whereas costs in respect of maintenance, mains and services, fuel, wages, &c., had increased considerably. The year 1920 closed with a deficit of £1000; so that they were driven to ask for increases of rates. As to the other gas provisions, the Company were asking power to use additional lands for gas purposes at Kirby Cross, near Frinton. Under a Provisional Order of 1878, which the Company took over, they were prevented from extending the works on the existing site at Walton, and they had to leave there as soon as possible, although this was very inconvenient, as the Company did not wish to make the change at a time when expenses were so high. As to the price, the present maximum was 5s. per 1000 c.ft. in part of the area and 5s. 6d. in the remainder, for 14-candle power gas. When the undertaking was originally taken over, the output was 17,000,000 c.ft. per annum. The present output was 31,000,000 c.ft., and the estimated output in 1930 was 58,500,500 c.ft. During the war the Company had exceeded their powers in the matter of price. They found that they could supply gas at the maximum price; but it would have consisted largely of air. By charging (illegally, it was admitted) 6s. 6d. per 1000 c.ft. over the whole area, however, they could supply a proper gas. This had been done, and nobody had complained. In the circumstances, he was of the opinion that the Company had adopted the right course. Dealing with the petitions, Counsel said that, generally speaking, they were all on the same lines. They objected to the dividend of 10 p.ct. on the new ordinary shares, and asked for a revision of price within a limited time. As a matter of fact, the usual revision clause had been inserted in the Bill, as he had already mentioned. It was also suggested that the Company should go to the Board of Trade for power with regard to the new price for gas, under the Gas Regulation Act, 1920.

Mr. *K. F. Hawksley* (the Chairman of the Company) gave evidence in support of the Bill, and confirmed Counsel's statement as to the finance of the Company. In order to raise capital for such a company at the present time it would be necessary to offer 7½ or 7¾ p.ct., as a small company was compelled to offer better terms than a large concern. Hitherto there had been no separation of the gas and water capital of the Company; but it was now proposed to separate them—putting aside £39,000 for the gas undertaking. In clause 11 of the Bill, it was proposed to reduce the time limit of 28 days to 7 days' notice of an issue of shares under the auction clauses, as it was considered that a term of 28 days was far too long. Clause 16 empowered the Company to subscribe to hospitals and other institutions, and to show at gas exhibitions. Objection had been taken to the gas undertaking having an exhibition of gas stoves and fittings; and the clause was inserted to remove this objection. The exhibition of gas-fittings was in the interests of the Company and the consumers, in that demonstrations would be given to consumers as to their use, which would increase the sale of gas. With regard to the gas supply, under the Order of 1878 the limited Company were authorized to supply gas in the parishes of Walton and Frinton, and when the statutory Company took over the powers in 1884 the limits were extended. In 1912 the limits were still further extended, and the prohibition from extending the Walton works was repeated. Clause 32 of the present Bill authorized the site for new gas-works. This site was purchased in 1913; but, owing to the conditions of the money market, they had been unable to build the new works. The intention was first of all to erect a gasholder on the site; and for this purpose the Company were applying for powers for a new main to carry the gas from the present works at Walton. But afterwards it was intended to build complete manufacturing works on the new site and close-down the Walton works. Speaking of the present price charged—namely, 6s. 6d. per 1000 c.ft., which was 1s. 6d. above the maximum authorized in 1912—he said that in 1919 it was found that the Company could not continue to supply a 14-candle power gas at the maximum price; and an application was made to the Board of Trade under the Temporary Increase of Charges Act of 1918 with a view to increasing the maximum charge. After discussion with the officials of the Board of Trade, however, it was agreed that the Act did not provide for a hybrid Company such as theirs, supplying water and gas. The only alternative, therefore, was either to supply a poor quality of gas or increase the price without the permission of Parliament. Even had the Board of Trade been able to grant an Order under the Temporary Increase of Charges Act, the effect would have been to wipe-out the dividend altogether on the "B" shares; while the dividend on the "A" shares would have been considerably reduced. To have wiped-out the whole of the dividends on the "B" shares would have been entirely against the principle of Parliament under the Temporary Increase of Charges Act; and, after taking all things into consideration, the Company decided to run the risk of increasing the charges. As a matter of fact, everybody was so pleased to have decent gas—it was a better supply than was given in North London—that there had been no complaints, nor had a single consumer refused to pay. He admitted that it was absolutely illegal; but the point had not been raised in any of the petitions against the Bill. The Company would have come to Parliament last year with a Bill but for the fact that the Gas Regulation Act was at the time under consideration.

Cross-examined by Mr. Thomas, witness admitted that the consumers in the district were not specifically told that the new charge was an illegal one; but the notice of the increase was made in the usual way on the demand notes.

Mr. Beveridge, for the promoters, challenged the right of Mr. Thomas to raise this point, as it had not been mentioned in the petition.

The Chairman said he thought that as the promoters themselves raised it, it was open to opposing Counsel to deal with it also.

Witness, continuing, in relation to this particular point, said that as a matter of fact the Local Authorities were fully aware of what the Company were doing, and had raised no objection at the time.

Mr. Thomas said his instructions were that the Local Authorities were not aware that what was being done was illegal. Continuing, Counsel, referring to the 10 p.ct. on the new ordinary shares, said this was a cumulative charge, and suggested that it was not a profitable way of raising money for a public utility company.

Witness said that every water company in the country had this power for first capital.

Mr. Thomas, referring to the provisions of the Gas Regulation Act, 1920, said that Parliament had created special machinery for applying to the Board of Trade where increases in gas charges were desired. The Company were, therefore, taking an exceptional course in coming to Parliament instead of to the Board of Trade. He asked whether the Company were seeking anything in relation to gas charges which could not be granted by the Board of Trade.

Witness replied that the Company was primarily a water company, and they had come to Parliament to re-arrange charges for both water and gas—the two must come together. Had the Company gone to the Board of Trade, separate inquiries would have been necessary, and therefore by coming to Parliament the whole thing could be done at once. Asked whether he would be willing to arrange a certain period within which the works should be discontinued on the Walton site, witness said that the only difficulty in agreeing was that other petitioners had asked them not to move the works too soon, because it would tend to increase the price of gas. Frinton, for instance, did not wish to pay the increased price which would result from the moving of the works at the present time.

Mr. Thomas asked whether the Company were prepared to give the Local Authority the right to acquire the site for public purposes after the gas-works had been discontinued.

Witness said they were open to sell the site to anybody, provided they were not compelled to clear it.

Mr. Thomas replied, however, that this was a matter to be settled when the price was considered.

Wednesday, April 20.

Witness, in re-examininationto-day, agreed that section 3 of the Gas Regulation Act stated that it would not be lawful for any person to charge for the supply of gas according to the number of British thermal units supplied unless authorized to do so under this Act or by Special Act of Parliament, and this implied that it was open to the promoters to come to Parliament for the necessary powers. The Act did not authorize the acquisition of lands and the laying of pipes, however; and parliamentary powers were necessary for these purposes. As to the Walton site, when the manufacture of gas was discontinued there, a gasholder would be left in the interests of the consumers in Walton. It was undesirable to fix a time for the removal of the works,

in the interests of the consumers, owing to the fact that the price would have to be increased, if the change had to be made in difficult times as regards money. The only complaints made against the increase in the price of gas were on the part of the slot-meter consumers, who did not want to pay an additional sum when the contents of the meters were collected, the meters not having been altered; but at the same time they all paid.

Mr. *Frank Jones* gave evidence in support of the Bill. He had acted in an advisory capacity for the Company during the past ten years, and had advised them with regard to the gas provisions of the Bill. He considered the capital requirements of the Company were reasonable, and estimated that the total requirements of the gas undertaking for the next ten years would be £87,000. The works at Kirby would absorb about £50,000; and provision would be made there for an output of 66,000,000 c.ft. per annum. The price represented about £800 per million cubic feet. From a financial point of view, he did not see how the Company could transfer the works from Walton at the present time, owing to the high prices obtaining. The Kirby site was admirable for the manufacture of gas, and ultimately gas could be produced there more economically than at Walton. The new price per therm which was proposed by the Bill—namely, 1s. 7·6d.—was arrived at in exactly the same way as if the Company had applied to the Board of Trade under the Gas Regulation Act. In this case, it was a simple calculation. The present maximum price was 5s. per 1000 c.ft., so that the price per therm would be 1s. based upon the calorific value of 500 B.Th.U. The figure he had advised should be added in respect of increased cost of production since June, 1914, was 7·6d. per therm; making the standard price 1s. 7·6d. per therm. This was a very moderate standard charge and not at all excessive. As regards the extra charge for the hire of prepayment meters, this was a little more than the Board of Trade had given; but it was still very moderate. It was proposed to charge an additional 2·2d. per therm, which equalled 11d. per 1000 c.ft., instead of 10d.; and for meters, fittings, and stoves they were asking 2·8d. per therm, equivalent to 1s. 2d. per 1000 c.ft., instead of 1s. Under clause 44 the Company had asked power to increase the price by 2d. per therm when the gas was supplied from the new site. This was necessary because capital would have to be used for the moving of the works, upon which there would be no return, and the shareholders would have to bear the whole loss. As to pressure, the figures were the same as those set out in the Gas Regulation Act. The Company were not the only gas undertaking which had come to Parliament for powers to charge on the therm basis; so that this Bill was not unique in this connection. The Tendring Rural District Council had pointed out that although powers were granted to the Company to supply their area in 1912, they had not done so; but this was due to the intervention of the war, and the difficulty of linking-up such sparsely-populated districts. Under the 1912 Act, the Company were entitled to charge 6d. per 1000 c.ft. more in the rural district than in the urban districts of Walton and Frinton; but under the Bill they would be charged on the same basis.

Mr. JACQUES ABADY, cross-examining on behalf of the Tendring Rural District Council, speaking on the question of coming to Parliament instead of to the Board of Trade, suggested that by coming to Parliament and putting figures into the hands of Counsel, instead of sending them into the Board of Trade for examination, the Company were not doing the right thing. As to the price to be charged per therm, he pointed out that in June, 1914, the Company were supplying gas of 550 B.Th.U., at a standard price of 5s. per 1000 c.ft. Having regard to this fact, therefore, the price per therm should now be based on that figure, instead of upon 500, which would make the new price 11d. per therm instead of 1s.; the total being 1s. 6·6d. instead of 1s. 7·6d.

Witness said that it was the practice of Mr. Honey, of the Gas Department of the Board of Trade, when dealing with this matter, to assume that the quality of the pre-war gas was 500 B.Th.U., and, therefore, they had calculated their price on the same basis.

Mr. ABADY said he understood that the pre-war quality was generally assumed to be 500 B.Th.U. in the absence of any direct evidence as to quality; but in this case 550 B.Th.U. gas had been supplied.

Witness did not agree.

Mr. ABADY suggested that the application to increase the price of gas by 2d. per therm when gas was supplied from the new works was one which could not be made under the Gas Regulation Act, and that if, owing to circumstances in the future, it were found necessary to increase the charges, the Company were protected by the revision clause already in the Bill. They could come to Parliament at a future date for a Provisional Order; and it was without precedent for a Parliamentary Committee to fix a price based upon a contingency which might happen at some future date.

Witness did not agree that such an application was without precedent.

Mr. ABADY suggested that the extra price should be reduced to 1·2d. per therm, because under the Act of 1912 the Company were authorized to charge an extra 6d. per 1000 c.ft. in the Tendring Rural District, and its equivalent was 1·2d. per therm, and not 2d. If this price were reduced as he had suggested, the Tendring Council would have nothing further to say with regard to the gas provisions of the Bill.

Cross-examined on behalf of the Walton Urban District Council, witness said the Company did not object to being under an obligation to close the Walton works within a reasonable time; but if a definite period were fixed, they might not be able to carry out their obligations owing to altered conditions, labour disputes, or other unforeseen circumstances. They might probably arrange a provision to move within a certain period, with a proviso that reasonable extension should be given in the event of unforeseen circumstances arising.

In re-examination, witness said that the Tendring Rural District were not now charged 6d. more than in the other districts—the price was 6s. 6d. per 1000 c.ft. over the whole of the Company's area. By asking that the extra price should be 1·2d. per therm instead of 2d. when the gas was supplied from the new works, they were actually asking for a lower price than the remainder of the area.

Mr. *William Cash* presented numerous tables to the Committee, setting out in detail the authorized and unissued capital of the Company, and the capital expenditure and working costs of the water and gas undertakings for the past ten years. As to the estimated gas revenue, the gross profit per 1000 c.ft. for the five years to 1926 was 29·47d., or £4346 in 1922, rising to £5522 in 1926. The pre-war cost of producing 550 B.Th.U. gas was 6·64d. per therm; while at present it would cost 14·37d. per therm to produce 500 B.Th.U. gas—a difference of 7·73d. per therm. This should have been the new price asked for under the Bill, instead of 7·6d.

Mr. JEEVES, on behalf of the Tendring Urban District Council, said he understood it had now been arranged that there should be no increase when the gas was supplied from the new works, and the Company would not be able to charge more than 1s. 7·6d. per therm after the change, unless they obtained the sanction of the Board of Trade, by reason of unforeseen circumstances. This would satisfy him, and he understood that it satisfied Mr. Thomas on behalf of the Walton Urban District Council. If this were so, the Committee would no longer be troubled with the gas provisions of the Bill.

It was also agreed that the Company should discontinue the works at Walton within five years of the passing of the Act, or within such period as may be agreed between the Company and the Walton Urban District Council. A clause was to be inserted to this effect.

Clause 44 (price of gas) was amended, fixing the price of gas at 1s. 7·6d. per therm before and after it is supplied from the new works, and a proviso was added that if at any time it is proved to the satisfaction of the Board of Trade that the costs of production and supply of gas have substantially altered from circumstances beyond the control of the Company, the Board of Trade may, if they think fit, on the application of the Company or the Local Authority, make an amending Order under section 1 of the Gas Regulation Act correspondingly revising the charges authorized under the present Act.

This concluded the consideration of the gas provisions of the Bill.

BURNLEY CORPORATION BILL.

Section B of the Local Legislation Committee of the House of Commons, presided over by Mr. E. Gardner, considered this Bill on Tuesday and Wednesday, April 19 and 20. Clause 79 of the Bill gives the Corporation power to purchase or take on lease offices, showrooms, and other buildings for the purpose of its gas undertaking, and to erect, fit-up, maintain, and let any such buildings upon any lands belonging to the Corporation for the purposes of the undertaking.

There was no opposition.

No other part of the Bill relates to the gas undertaking.

RADCLIFFE AND LITTLE LEVER JOINT GAS BOARD BILL.

This Bill came before the Unopposed Bills Committee of the House of Commons on Thursday last, April 21—presided over by Mr. J. H. WHITLEY.

The objects of the Bill are to constitute and incorporate a Joint Board consisting of representatives of the Urban District Councils of Radcliffe and Little Lever, and to transfer to and vest in the Board the undertaking of the Radcliffe and Pilkington Gas Company. The Bill as originally deposited (under the title of the Radcliffe and District Joint Gas Board Bill) included the districts of Prestwich and Whitefield; but the local authorities in these latter districts subsequently withdrew.

The CHAIRMAN said he had observed that the Bill was very different from the one originally introduced, and there were reports from the Home Office and the Ministry of Health. He would like to know whether these reports referred to the Bill as amended or to the Bill as originally deposited.

Mr. R. C. DODDS (Messrs. Lewin, Gregory, and Anderson, Parliamentary Agents) replied that the reports referred to the original Bill; but certain alterations had been made in consequence of them.

The CHAIRMAN said that as two of the constituent authorities had withdrawn, owing to the ratepayers not having given their assent, the circumstances were altered so greatly that the Bill as it stood at present should go back to the Ministry of Health. The Committee could not consider a report made in circumstances which did not now exist.

Mr. DODDS said the Bill, as amended, had been lodged with the Ministry of Health two or three days previously, and he thought he would have heard had there been any further objection. At the time the two remaining authorities resolved to proceed with the Bill, they were aware of the fact that Prestwich was a very doubtful party to the scheme; their area being partly in the gas area of the Salford Corporation and partly within that of the Radcliffe Company. Therefore, the present contingency was contemplated by the remaining authorities, whose resolutions were passed in such a form as to say they would promote the Bill whether the other authorities went on or not. The Radcliffe Council were even prepared to proceed alone.

The CHAIRMAN, however, insisted that the Bill should go back to the Ministry of Health, in order that they might have an opportunity of deciding whether, in the changed circumstances, they had anything further to say.

The Bill was, therefore, held-over pending a supplementary report from the Ministry of Health.

Values of Tar Products.—A letter has been received by the Southend Corporation Gas Committee from the contractor for the purchase of the surplus tar from the gas-works, stating that, as a result of the heavy drop in the values of tar products which has recently occurred, they are compelled drastically to revise the price which they have been paying for crude coal tar, and offering a sum much less than that contained in their contract for the tar purchased from the Corporation. The Committee decided to inform the firm that they could not see their way to accede to any variation in the terms of the contract.

MISCELLANEOUS NEWS.

LIMITATION OF INERTS.

BOARD OF TRADE COMMITTEE SITTINGS.

Monday, April 18.

The Committee appointed by the Board of Trade, under the Gas Regulation Act, to inquire into the percentage, if any, of incombustibles which may be supplied in town gas, met again after the Easter Holidays, on Monday, April 18. Evidence was heard from Mr. A. E. Broadberry, the Engineer and Manager of the Tottenham Heat, Light, and Power Company, and Mr. T. F. E. Rhead, the Chief Chemist to the Birmingham Corporation Gas Department. Both witnesses sat together at the witness-table, though they made separate statements to the Committee. Mr. J. Hunter Gray, K.C., was in the chair, and the other two members of the Committee, Mr. W. J. A. Butterfield and Dr. Lander, were also present.

Mr. Broadberry, after thanking the Committee for affording him the privilege of expressing his views against the suggestion that an Order should be issued restricting to any specified figure the "inerts" in any delivered gas, urged as strongly as possible that the new system of charge per "therm" was in itself the strongest possible factor in restricting companies to the level of the greatest economy, both to the gas undertaking and to the consumer. As he understood it, this was the sole *raison d'être* for the drastic change. It ensured that the consumer should only be charged for the energy supplied to him. The only possible reason for the undertakers sending out inerts at all under the system was that it would be too costly to eliminate them; and the extent to which they were likely to be present must depend on what was the most economical way to handle existing gas-making plant, or plant that might be devised in the future for producing gas at the cheapest cost per therm. Any specified restriction would trammel the very development which was outlined in the report of the Fuel Research Board which gave rise to the Gas Regulation Act. The following extract from the report itself put the case, he thought, more eloquently than he could:

> "So long as the technical staff of the gas undertakings are compelled to narrow their outlook and limit the exercise of their imagination by the prime necessity of conforming to a stereotyped standard evolved to suit average conditions, and having no direct relation either to the needs or the resources of their own district, so long will they be compelled to lag behind in the industrial race."

Mr. Broadberry then proceeded to show that the removal of restrictions in the past had been concurrent with a reduction of cost per therm to the consumer. In a half-yearly diagram of the Tottenham Gas Supply from 1905 to 1914, this effect was clearly shown. The Tottenham Company's Act of 1906 gave relief from the sulphur clauses and substituted the No. 2 "Metropolitan" for the No. 1 "London" argand for the illuminating power standard. Illuminating power was then rapidly ceasing to be of importance, because of the general adoption of the incandescent burner. During the period named the make of gas per ton gradually increased from 10,758 c.ft. at the end of 1905 to 13,388 c.ft. at the beginning of 1914. This obviously meant an increase of "inerts." It was accompanied by a reduction in the cost per therm from 5·90d. to 4·62d. If any future restriction of inerts sent gas supplies back to the original position, the diagram had only to be read in a reverse direction to see what the effect would be on the cost per therm. It would be that the cost of the therm would be increased.

Table *showing the Increase in the Make of Gas per Ton at Tottenham.*

Period.	Make per Ton.	Coal Gas Calorific Value.	Therms per Ton.
Dec., 1905	10,758	569	61·3
June, 1906	10,820	578	62·6
Dec., 1906	11,721	590	69·2
June, 1907	11,822	575	68 0
Dec., 1907	11,894	584	69·5
June, 1908	11,762	566	66·5
Dec., 1908	11,872	546	64·8
June, 1909	11,879	552	65·6
Dec., 1909	11,654	565	65·8
June, 1910	12,321	539	66·5
Dec., 1910	12,386	560	69·4
June, 1911	12,195	558	68·2
Dec., 1911	12,781	550	70·2
June, 1912	12,785	538	68·9
Dec., 1912	12,949	532	69·1
June, 1913	12,901	517	66·7
Dec., 1913	13,205	521	68·8
June, 1914	13,388	526	70·5

On cost of purification alone, the result would be disastrous. Costly lime purification would have to be re-introduced to deal with carbonic acid, involving new purifying plant, occupying much space, costing the outlay of much capital on which interest would have to be paid by the consumer, and recreating the old nuisance. The custom of using air in the oxide of iron purifiers to assist in keeping the oxide active would have to be abandoned; and, again, larger purifiers would have to be provided and changed much more frequently, which again would involve heavy labour costs and interest on capital. It would be retrogression in place of progress. During the years above referred to, with the increase of inerts the Tottenham Company were able to prevent the loss of B.Th.U. out of the retorts into the flues. It must be remembered that retorts were not always new and bottle-tight; and after (say) one year's use, there were cracks through which either gas passed out of the retorts, or flue gases must be permitted in some degree to enter. It must also be remembered that the Company were working all the time against a dual standard—candle power and calorific. Oil was cheap then, and no doubt would be again. His Company found it economical to do some over-pulling and preserve the B.Th.U., and at the same time to use oil in the carburetted water gas plant sufficient to maintain the necessary standards. This they did successfully, and contributed considerably thereby to coal conservation, which now became daily more and more necessary to the nation. From the consumer's standpoint, taking the majority of consumers in the majority of districts, now that the charge was to be only for the energy constituents supplied, it mattered little or nothing what amount of inerts the gas contained. This had been shown clearly by the Leeds University researches. In these circumstances it was not in the interest of the consumer to have to pay a higher price per therm to have his energy in a more condensed form. If he had highly concentrated energy, he would have to break it down. For most purposes—even for intense heating—the required results were obtainable even with gas high in inerts. It was merely a matter of using more volume at higher pressure.

He would like to say a word or two on what in his opinion should really be described as inerts. It was admitted on all hands that illuminating power was obsolete. Almost all gas was now used in atmospheric burners. The consumer was now only charged for the energy constituents. It did not affect him whether the air which was necessary for combustion was added at his burner or at the gas-works. It was therefore submitted that, in all reasonableness, the practice of including in the "inerts" not only the carbonic acid and the nitrogen not otherwise accounted for, but also the oxygen and four times its volume of nitrogen, which represents air, was all wrong. The oxygen and nitrogen belonging to it must surely be deducted to obtain the figure of true inerts, simply because it was air which the consumer would have to add if it were not there already. It did not therefore properly belong to the inerts, and it was unfair to include it. Under old conditions when the charge was based only on volume, the consumer would have to pay for it; but now that the charge was to be by therm he had not, which made all the difference and emphasized the value of the new system of charge. All these considerations made it quite clear that there could be no advantage to any gas undertaking working under the Gas Regulation Act to send out an undue or uneconomical proportion of constituents for which they received no payment. The therm was the key to the whole situation. The consumer was not hurt by the inclusion of what inerts the suppliers found it necessary for economic reasons to associate with their supply. The suppliers were business men and were not likely to ruin their business by sending out what would displease their customers—particularly when they were not paid for it. On the other hand, they had sense to realize that by unnecessarily increasing the bulk of their commodity it cost more to handle, and required larger and consequently more costly gasholders to store it, larger plant of every description to deal with it, and larger mains to carry it; and surely it was for them as business men to ascertain by what proportion they and their customers obtained the greatest advantage. He had had over forty years' experience in gas manufacture and distribution; and if he were now called upon to say where the greatest good for the consumer lay for the future in regard to inerts, he should find it difficult to fix even any approximate figure, and with the safeguard of a charge per therm he should take care to place it sufficiently high to avoid restricting progress. He would make it high enough to admit what was called "air gas" if such a system should ever be able to give the consumer the greatest heat at the smallest cost. This he was convinced was in the mind of the Fuel Research Board when they recommended the "therm" system of charge, and included the expressive words he had already quoted.

The Chairman: I gather that your view is that there should be no limit at all put upon the inerts?—I think the therm itself limits the inerts to the greatest possible degree.

Answering further questions by the Chairman, who mentioned that there were some people who held the view that there should be a limit,

Mr. Broadberry said it would be very uneconomical to get down to as low as 5 p.ct. of inerts, as had been suggested, even in modern plants. It would mean that a lot of B.Th.U. would be lost in the flues in order to be able to get down to a figure anything like this. The percentage of inerts (taking power purposes) made a difference when gas was charged for by the cubic foot; but on the therm basis the consumer only paid for the heat units he received. At the present time the Tottenham Company were running on about 20 p.ct. inerts; but he had heard of cases of 40 p.ct. The 20 p.ct. in the Tottenham case was total inerts, including air; the true inerts would be about 17 p.ct. Generally the pressure on his system was about 3 in., and he found that with this pressure and percentage of inerts, a satisfactory service was given.

Period.	Calorific Value.	Price per 1000 C.Ft.	Price per Therm.
		d.	d.
Dec., 1905	577	34	5·90
June, 1906	593	32	5·40
Dec., 1906	562	32	5·70
June, 1907	560	30	5·35
Dec., 1907	554	30	5·42
June, 1908	550	30	5·45
Dec., 1908	538	30	5·59
June, 1909	535	29	5·42
Dec., 1909	525	29	5·42
June, 1910	533	28	5·25
Dec., 1910	534	28	5·25
June, 1911	548	27	4·92
Dec., 1911	539	27	5·01
June, 1912	526	26	4·95
Dec., 1912	522	26	4·98
June, 1913	514	25	4·87
Dec., 1913	515	25	4·85
June, 1914	519	24	4·62

Referring again to a large diagram which was exhibited to the Committee, Mr. Broadberry drew attention to the fact that, converting the prices from the thousand cubic feet basis to the therm basis, during the period from 1905 to 1914, when the amount of gas made per ton of coal increased from 10,758 c.ft. to 13,388 c.ft., with an increase in the percentage of inerts and a fall in the calorific value, the price to the consumer fell from 5·90d. to 4·62d. per therm—a drop which was in far greater ratio than the drop in the calorific value. This proved conclusively that it was in the interest of the consumer to give the gas company freedom to supply gas according to the most economical methods.

The CHAIRMAN: I do not see why you take that curve as showing that an addition of inerts was an advantage to the consumer?

Mr. BROADBERRY said that the curve showed that the price to the consumer fell as the inerts increased and the calorific value decreased. The increase in the inerts was due to the extra pull and to using oil, which was cheap at the time. By doing this, it had been possible to maintain an illuminating standard as well as a calorific value standard. At that time he was working to two standards, although the illuminating power standard had since been abolished. The method of operation was to get the largest amount of gas possible out of the coal and enrich it with water gas. He had not the slightest doubt that the same conditions would arise again before very long. Oil had been dear; but it was coming down very satisfactorily.

Mr. BUTTERFIELD suggested that the cheapening of the gas under these conditions was due partly at any rate to the cheap oil, and not because there were extra inerts?

Mr. BROADBERRY said that was true to some extent; but on the other hand the price of coal went up during the period named from 14s. 6d. to 18s. 8d. per ton, while the price of oil fell very considerably, as seen from the following table:

Price of Coal and Oil.

—	Coal per Ton.	Oil per Gallon.
	s. d.	d.
Dec., 1905	14 6·46	2·75
June, 1906	14 9·57	2·80
Dec., 1906	14 9·44	2·94
June, 1907	15 5·74	3·04
Dec., 1907	16 6·99	3·14
June, 1908	17 1·07	3·26
Dec., 1908	17 1·87	3·26
June, 1909	16 4·34	3·09
Dec., 1909	15 4·26	2·70
June, 1910	14 11·28	2·64
Dec., 1910	15 2·68	2·22
June, 1911	15 0·41	2·11
Dec., 1911	14 11·27	2·08
June, 1912	14 11·71	2·07
Dec., 1912	15 10·07	2·06
June, 1913	16 10·37	2·22
Dec., 1913	18 3·93	2·31
June, 1914	18 7·80	2·47

Mr. BUTTERFIELD: With regard to your comments on the cost of purification being increased, that would depend on the limit?

Mr. BROADBERRY said that, if the limit was sufficiently high, it would interfere with present methods of working. As to the inerts in coal gas and water gas—in the latter case, for instance, if one tried to avoid making carbon dioxide, the oil efficiency fell immediately. If they tried to keep carbon dioxide below 3 p.ct. in a carburetted water gas plant, the oil efficiency would drop; and that again made it inadvisable to try to keep the inerts too low. With coal gas at 13,388 c.ft. per ton, the inerts were about 22 p.ct.; but with the mixed gas it would be higher. The average during the period he had already mentioned for Tottenham would be about 45 p.ct.

The CHAIRMAN asked witness's views as to the railway companies' suggestion that the limit should be placed at 6 p.ct. per 100 B.Th.U.

Mr. BROADBERRY said the railway companies were always a very meddlesome people. Although he should not think such a percentage would interfere very much at present with his own methods of working, yet he was convinced it would be bad for the consumer in the long run in helping to keep up the price per therm.

Mr. T. F. E. RHEAD, the Chief Chemist of the Birmingham Gas Department, said that Birmingham used about 12,000,000,000 c.ft. of gas per year, supplied from four separate sources, and composed of gas made in the following proportions (approximately):

1.	2.	3.	4.
19 p.ct. coke oven gas.	80 p.ct. steaming Woodall-Duckhams.	45 p.ct. horizontals.	75 p.ct. horizontals.
33 p.ct. inclineds.	20 p.ct. carburetted water gas.	45 p.ct. steaming Woodall-Duckhams.	25 p.ct. blue water gas.
15·5 p.ct. horizontals.		10 p.ct. carburetted water gas.	
10·7 p.ct. Dessau			
21·8 p.ct. carburetted water gas.			
52 p.ct. of whole.	31 p.ct. of whole.	5·5 p.ct. of whole.	11·5 p.ct.

It is used for the following purposes in the proportions shown:

	P.Ct.
Domestic heating and lighting Factory ,, ,, Street lighting	68
Manufacturers—furnaces, &c.	19
Motive power—gas-engines	13

During the last few years the gas had contained from 20 to 22 p.ct. of inerts (including air) and had had a calorific value of 480 to 500 B.Th.U. gross. Though consumers had had considerable trouble due to naphthalene on the district and (at times) due to variations in calorific value and specific gravity, there was no evidence of trouble directly due to inerts. During the coal strike last October, when the quality was dropped to about 440 B.Th.U., several complaints were made by manufacturers using furnaces with atmospheric burners, although the inerts were from 2 or 3 p.ct. lower than usual. A lower inert content would be a decided advantage to Birmingham, as it would increase the carrying power of the distribution system; but owing to unavoidable delay in the necessary repairs to carbonizing plant worn-out during the war, and similar delays in providing purification plant, it had been quite impossible to meet the demand with a gas containing a lower percentage of inerts. The supply to their outlying districts was reinforced by a high-pressure system—about 6 p.ct. of the output taking this form. Taking into account the diversity of the Birmingham plants and the unsatisfactory state of repairs or replacements, it would be impossible, with the normal output, to make gas conforming to the 20 p.ct. limitation of inerts content suggested by the Fuel Research Board. This state of affairs was likely to exist for some years. Conformation to a penal limit of 20 p.ct. would mean not meeting the demands. The present policy in Birmingham was to improve the works to give a gas approaching the ideal aimed at by all up-to-date concerns —*i.e.*, a gas constant in calorific value, specific gravity, and pressure, and with as low an inert content as was economical with the plant involved. Expense and decreased capacity of distribution would exert sufficient compulsion on the gas industry not to make gas of high inert content, unless there was something very tangible to be gained thereby. After carefully sifting all the practical evidence put forward for such inerts limitation, and also the research work on the subject, there did not appear to be sufficient guidance for anyone to fix a limit without risking the very promising future of the industry.

The permutations and combinations of the three chief combustibles, CH_4, H_2, and CO, and the inerts, O_2, N_2, CO_2, which could give gas mixtures of similar calorific value, were so great that he would be a bold man who, on the present evidence, would pick one out with a particular inerts content, and say: "That gas will most benefit the consumer." True, it might suit one particular set of circumstances; but these circumstances varied in different districts, and every district would need special consideration. The best and least cramping plan would be to trust the common sense of the industry to meet its demands and obligations in the best way. Economic considerations would prevent the bulk of the industry from alienating its customers; and although it was quite conceivable that legal limitation of inerts might keep the few careless companies up to the mark, it would doubtless act as a brake on the progress of the great majority of concerns, and the community would lose thereby. The evidence as to the deleterious effect of inerts on lighting and furnace work appeared to be far too vague at present to legislate on; and in the industry it was felt very strongly that it would be a great mistake to increase the difficulties of gas manufacture, and hinder the new spirit of advance which was released by the passing of the 1920 Act. There was a tremendous readjustment of ideas taking place in the gas industry, and a great increase in scientific methods and control; and he ventured to say that given freedom (not licence) under the 1920 Act, great progress would be made in the production and use of gas during the next ten years. Why make hampering restrictions of doubtful merit, he said, which might easily destroy the possibilities of this future progress, and deprive the community of the obvious advantages of a cheaper gas supply—viz., less smoke and better health? It was impossible at present to forecast whether the cheapest satisfactory B.Th.U. would be associated with high or low inert content.

The CHAIRMAN: Then you are also of the opinion that there should be no limit to the inerts at all?—Yes.

Mr. RHEAD, answering further questions, said that it would be impossible with the present plant at Birmingham to make a gas giving only 20 p.ct. inerts. That could only be done when more plant was installed, and the works were extended. That was largely due to the air which had to be put in for the purification process, owing to the cramped condition of the works. Moreover, owing to the poor quality of the oxides he was getting, he was compelled to put in more air—something from 8 to 10 p.ct.

Mr. BUTTERFIELD: Your arguments are based on your temporary conditions, which will only apply during the two or three years, or whatever it is, that are necessary to bring the plant up to date?

Mr. RHEAD said that was so as far as Birmingham was concerned. Whether the period would be a few years or not, he could not say. At the same time, he agreed that a 20-p.ct. limit would not hurt Birmingham once the plant was running.

You suggest that if a limit is put, it should exclude the air?—Most certainly.

I take it from both you and Mr. Broadberry that you do not think the air is harmful?—It is not harmful to the consumer in any way.

In answer to further questions, Mr. Rhead said that their ordinary vertical retorts made about 33 p.ct. of the total output at Birmingham. With all the types of plant that there were at Birmingham, if in good condition, they would not get what could be called high inerts; but the difficulty was to keep them in good condition. The quality of the coal had a bearing on inerts, and the plants were always needing repair, with the result that their average condition was pretty bad. It was hoped to eliminate the Dessau plant, which gave a great deal of trouble. It seemed impossible to get the right type of retort material; and that was another reason for high inerts at the present time. The Dessau retorts were not being worked steaming, but the Woodall-Duckham retorts were steaming between 10 and 20 p.ct. He was making from 13,000 to 14,000 c.ft. of gas per ton of coal. The coke-oven gas was obtained from plant on the works, and under the control of the Department; but he did not think it likely that the percentage of gas obtained in this way would be increased. They were putting in more and more verticals; but there was the point that, in the case of coke-oven gas which was purchased from outside by some gas undertakings, the placing of a limit on the inerts might be a serious matter, as the gas undertaking purchasing the coke-oven gas had no control

over the percentage of inerts. On the coke-oven gas plant at Birmingham, they were running at about 15 p.ct. of inerts. The water-gas plant at Birmingham was running at about 15 to 16 p.ct. of inerts—that was true inerts. The Woodall-Duckham retorts, steaming, gave about 12 to 13 p.ct.—*i.e.*, 3½ to 4 p.ct. of carbon dioxide.

A short discussion took place with regard to the railway companies' proposal for a 6 p.ct. limitation of inerts per 100 B.Th.U.; and Mr. Rhead was asked to send in to the Committee a statement of his views in opposition to the statements made by the railway companies.* His point was that sufficient practical experience was not yet available to justify the drawing of definite conclusions as to the effect of increasing the inerts and decreasing the calorific value.

Speaking with regard to the use of gas for furnace purposes, Mr. Rhead said that when the quality of gas in Birmingham dropped to 440 B.Th.U., there had not been any complaints. There was a Testing Research Laboratory attached to the Gas Department which very carefully controlled the type of furnace used in the district, and the Department never advised the putting-in of any furnace until it had been tested by them in the experimental laboratory. Although a good deal of the apparatus in use was up-to-date, there was, nevertheless, much that he would like to see eliminated. Much of the trouble that had been heard of in different towns in regard to furnaces was due to fluctuations. If a steady pressure, calorific value, and specific gravity were given, much of this trouble would disappear. This was why—although a reasonable limitation would not be detrimental to Birmingham—he felt it would be a big mistake in policy if the industry had to work out its salvation under the new Act while anything was done which would interfere with new processes of gas manufacture.

Mr. Butterfield suggested that there were some gas undertakings in which the commercial incentive did not seem to be so great as in others. There was not the same keenness, for instance, as there was with most of the companies and in towns like Birmingham. In this case, he asked, would it not be necessary to give the consumers some protection in the form of a limitation?

Mr. Rhead said the force of the opinion of consumers was now becoming so great that if such undertakings existed, they would be compelled to come into line. He thought moral suasion would be far more effective than legislation. These people would soon come to realize what they were losing in distribution by sending out an excessive quantity of inerts. He was convinced that any action to bring these few people up to the mark by means of legislation would, in the long run, be bad for the general body of consumers, because it would hamper progress in other directions.

Mr. Broadberry mentioned, with regard to undertakings that sent out a very high percentage of inerts, that the Gas Regulation Act provided for the appointment of Gas Examiners in a way that examiners had never been appointed before; and he believed that gas all over the country would now be tested, whereas a great many localities in the past had never seen an examiner. Now, he believed all gas would be periodically examined, and this would be a safeguard against too high a percentage of inerts. Therefore, it all came back to the charge per therm, which was now really the governing factor of everything. So long as every undertaking was kept up to the mark as regards its declared calorific value, and the charge was on the basis of the therm, there was no advantage to anybody to send out high inerts.

The Committee adjourned until next day.

Tuesday, April 19.

Mr. Thomas Goulden, the Chief Engineer of the Gas Light and Coke Company, gave evidence to-day. He said that he fully recognized the desirability of the inerts in town gas being kept as low as possible, and would hold this view if for no other reason than that their undue excess is a wasteful burden on the distributing system generally, which was designed for the purpose of supplying the consumer with the heat units he required at the minimum cost. The present position in regard to the prejudice of the consumer arising from the presence of reasonable quantities of "inerts" was greatly different from that which existed at any period in gas supply previous to what may now be granted as having taken place—viz., the general adoption of the incandescent burner as the appliance by which gas is utilized for the purpose of obtaining artificial light. The difference was very material. In the case of the open flame the prejudicial effect of inerts, especially of carbon dioxide, was considerably beyond the ratio in which they were present in the gas; whereas now the effect, assuming that the calorific content of the gas was not lessened, was only decreased by the extent to which the calorific intensity of the flame was reduced by the cooling effect of the inerts on the general temperature of the flame. When it was considered that the calorific intensity of the combustible constituents of gas varied between 2642° and 2982° C., it would readily be understood why the heat constituents of gas—except possibly in metallurgical operations requiring the greatest possible temperature of combustion—were so little affected in their efficient action, whether for domestic or for industrial application, as was generally found. Dr. Carpenter had already given evidence in this connection, with which he (witness) agreed.

The main point in this enquiry appeared to consist, after the prejudicial effect of "inerts" had been correctly interpreted, in determining as to the possible effect of their limitation on the economic production of gas. That gas could be produced with a minimum of inerts—say, not exceeding an average of about 8 p.ct.—was admitted; but such gas, in relation to that which could be economically supplied, would be similar to a chemical, "chemically pure," for analytical purposes, produced and supplied in place of the same chemical "commercially pure," the sale of which was for general use. For general use, the greater cost of production of the quality required for analysis would be so much waste. In the matter of gas production, an undue limitation of inerts, whether voluntarily or by statute, must react on the cost of producing the heat units, in respect of which alone the manufacture of gas was now conducted. In the first place, to ensure a minimum of carbon dioxide would necessitate the restriction of the description of coal that could be used for the purpose of carbonization. The Gas Light and Coke Company were compelled during the war to use many varieties of coal which they would have preferred to dispense with, one of which coals produced as much as 8 p.ct. of carbon dioxide. The only practicable material of which gas-retorts were made was some form of fireclay. Great improvements had been made in these; but they still possessed some degree of porosity which it had not hitherto been found possible to eliminate. The consequence was that if gas undertakings were not prepared to lose some of the gaseous constituents given off by coal during the process of carbonization, small but varying proportions of the furnace gases by which the retorts are heated must percolate inwards from their exterior, and so add to the minimum which under other conditions might be secured. Renewals of retort-settings, always expensive, but now at least trebly so, would have to be more frequently made, in order to secure best possible conditions. In order to lessen the pressure on the retorts due to the train of purifying plant through which the gas had to be forced, and in order to overcome the weight of the gasholders, which would otherwise result in serious loss of gas by reason of the resulting pressure in the retorts, exhausting pumps are necessary. Between these and the retorts, a partial vacuum existed in the connections and in any apparatus that might be interposed. There was thus a permanent potential source of infiltration of air between the exhauster and the retort mouthpiece. In the ordinary processes of commercial production some small addition of inerts in this part of a gas-works plant could not be entirely avoided, although every reasonable care might be given to prevent such addition.

The London Gas Act of 1905, among other of its provisions, released the Metropolitan Gas Companies from the obligation to remove the sulphur compounds from the gas supplied—thus freeing them from the necessity of using lime in the process of purification, the nuisance and objectionable character of which was a main reason for the abolition of the "sulphur clauses." Absolute freedom from sulphuretted hydrogen was still adhered to; but this was removed by oxide of iron—lime not being necessary. The abolition of lime purification at once increased the "inerts" in the gas by the proportion of carbon dioxide present, the removal of which involved the use of lime, as well as being a necessary preliminary to the removal of the "sulphur compounds." As already indicated, this might, in an excessive case, contribute no less than 8 p.ct. to the inerts produced by a particular description of coal, although normally carbon dioxide should not exceed 3 to 4 p.ct. In order to maintain in working condition the oxide of iron used for the extraction of sulphuretted hydrogen in the purifiers, it was customary to pass air into them to the extent of from 3 to 5 p.ct. with the gas on its passage through the material. In many cases where coal contained high sulphur, or where purifiers were limited in capacity, larger proportions of air were necessary. One-fifth of the air so used, consisting of oxygen, was absorbed in re-oxidizing the sulphided oxide of iron—restoring it to its original condition of affinity for the sulphuretted hydrogen which it was its function to absorb. The remaining four-fifths, nitrogen, passed forward to complete the volume of inerts arising from necessary economic conditions of manufacture. Increasing the thermal efficiency of gas production in its relation to coal had rapidly come to the front as a question which had to be answered by the gas industry; the problem being to deliver economically into the gasholder for use by the consumer the greatest possible proportion of heat units contained in the original coal. This would only be solved by radical alterations in the methods hitherto generally followed, and might be held to involve generally the gasifying of varying proportions of the coke produced in retort-house carbonization, after providing for the necessary consumption on the works. This was already effected by the production of water gas, either in separate plant set apart for the purpose—the water gas, usually either "blue" or lightly carburetted, being mixed in the gasholders with the coal gas previous to distribution—or by the "steaming" of the coke produced by the distillation of coal in vertical retorts. By such processes the gaseous production of a ton of coal might be raised from 12,000 c.ft. to fully 30,000 c.ft., still leaving a margin of coke for sale. There were also a number of "total gasification" plants now being worked, in which it was claimed that gas up to 60,000 c.ft. per ton of coal was produced. The latter principle was undoubtedly capable of successful development; and the limitation of inerts would strongly tend to limit the extent to which economical developments in the production of gaseous heat units might be effected. He emphatically contended that the sale of gas by "therms" provided for in the Gas Regulation Act, is in itself a sufficient deterrent to any undue proportion of inerts in gas manufactured for sale; payment being based entirely on the combustible constituents. Moreover, the presence in any undue proportion of inerts would unnecessarily add to expenses, whether incurred within the works or throughout the distributing system—a fact that he believed was thoroughly recognized by gas engineers generally, and

---

* Mr. Rhead has since sent the statement referred to, as follows:

Supplementary Statement of Mr. T. F. E. Rhead.

Until further reliable evidence is forthcoming, the suggestion by the railway companies for a sliding-scale, allowing 6 p.ct. inerts for each 100 B.Th.U. per cubic foot of gas—whereby, for example, a 600 calorific value gas could carry 36 p.ct. of inerts, or a 300 calorific value gas 18 p.ct—does not appear to be based on sound theoretical considerations.

The concentrations of B.Th.U. per cubic foot in the products of combustion of the three principal gases are (mixed with just sufficient air for complete combustion):

	CH_4	CO	H_2
Gross	110	107	160
Net	81	107	90

For mixtures containing 6 p.ct. of inerts per 100 B.Th.U. gross, they are:

	CH_4	CO	H_2
Gross	103	100	146
Net	76·7	100	84·4

From these figures, it would therefore appear that a lower calorific value gas could carry a higher percentage of inerts per 100 B.Th.U., and the consumer would not suffer, providing he obtained the *same number* of B.Th.U. in either case.

which naturally they would seek to avoid. He would not hesitate to introduce "inerts" of the nature of air during such time of emergency as a serious breakdown of plant, or an abnormal demand at a period when for any reason—say, such as shortage of coal, strikes, or other circumstances tending materially to reduce the production of gas—normal supplies could not be given at adequate pressure. Without adequate pressure, even gas of the highest quality could not be efficiently utilized; but by the increased volume due to the temporary addition of air, the efficient use of the heat units that could be supplied would be ensured.

The Chairman: Your view, I take it, is that inerts can be kept down; but at the same time there are certain cases which, in your opinion, would be seriously affected by any legislative prohibition?

Mr. Goulden said his point was that he would not contend for a moment that gas could not be made with 8 or 10 p.ct. of inerts, but that such gas would not be economical, and it would not be possible to supply the same B.Th.U. which were required at the low price that they could be supplied at if the manufacture of gas was dealt with on broad commercial lines. There was all the difference between minimum inerts and a reasonable quantity.

The Chairman: That is to say, to obtain a gas which is chemically free from inerts would be an uncommercial proposition?—Absolutely.

Do you think it possible to keep within a certain maximum for inerts?

Mr. Goulden said he thought so. He had looked-up figures of three of the works of his own Company for the last weekly analysis of the gas. At Shoreditch, the calorific value was 475, and the inerts were 18 to 22 p.ct.—*i.e.*, all inerts, including oxygen as well as the carbon dioxide and the nitrogen. This would compare very favourably with the highest quality of coal gas that could be manufactured. At Beckton the calorific value was 485 to 486, and the percentage of inerts was 16·7 p.ct., including oxygen. At the Kensal Green works the calorific value was low—viz., 427 B.Th.U.—and the inerts were 17·9 p.ct. It was rather odd that (due to the large percentage of carbon monoxide) the last gas was of a superior value to the first case, in which the calorific value was 475. At the present moment these gases consisted of 60 p.ct. of coal gas and 40 p.ct. of water gas. They were making water gas rather heavily at the moment, in order to save coal.

The Chairman remarked that these figures rather suggested that the inerts were about 5 p.ct. per 100 B.Th.U. As a matter of fact, it was about 4 p.ct. Did Mr. Goulden think that a maximum of 5 p.ct. was a figure to which every gas undertaking could work?

Mr. Goulden replied that he certainly thought they ought to do so; but he would not like to suggest it as a penalty measure, because it was a very difficult matter to deal with. The analysis of gas for nitrogen was a very "nice" operation. Again, inerts included carbon dioxide, and this was not by any means all due to leaky retorts. Some of it came from the coal, and, as he had already mentioned, he had known coal during the war to give as much as 8 p.ct. of carbon dioxide, whereas the normal amount would be not more than 3 p.ct., and in water gas (say) from 5 to 6 p.ct. He would regard a maximum of 5 p.ct. of inerts per 100 B.Th.U. as too much for a penalty limit, for the reason that, as they came down the scale of calorific value, it was more and more difficult to keep the gas free from inerts. While it was perfectly possible to work to a figure of 30 p.ct. of inerts with a 500 B.Th.U. gas, at 400 B.Th.U. it would be very difficult to work to the same proportions.

The Chairman: Do you think it would be practicable, instead of saying there should be 5 p.ct. per 100 B.Th.U., that there could be a graduated scale (say) X for 400 B.Th.U., Y for 500, and so on?—Yes; because as you go down it is far more difficult to keep the inerts down.

Continuing, in answer to further questions,

Mr. Goulden said that, although it was possible to make a gas with less inerts if a pure coal gas was produced, yet if the consumer was not damnified by using a 475 B.Th.U. gas as against (say) a 560 B.Th.U. gas, then it was in the general interest that, even at the cost of a few extra inerts, the lower calorific value gas should be sent out, because, if for no other reason, it contributed very considerably to economy in coal. He regarded anything from 8 to 11 p.ct. of inerts as absolutely tip-top working and quite unnecessary.

The Chairman: In fact, does the consumer suffer practically by getting a 475 B.Th.U. gas, as against a 560 B.Th.U. gas?—No; so long as he does not pay any more for his therm.

Mr. Goulden added that both these qualities of gas could be used without any serious change in the burner. The general tendency was to make gas of lower calorific value; and in a test which had been made it was found that a burner set for a 550 B.Th.U. gas burned a 450 B.Th.U. gas quite well. The chief difficulty of inerts was due to the porosity of the retorts; and just at the present moment inerts might be expected to be higher than they would be under normal conditions. His own Company, for instance, had not been able to do any extensions during the war, and the repairs to retorts had been limited to the extent to which labour could be found to do the work. The Company was behind with construction now. At the present time a good deal of the gas at Beckton was made in retorts which were in nothing like proper order; and if he made daily tests, he would probably find well over 20 p.ct. of inerts. This must be taken as indicating a fairly general state of things throughout the country, due to the causes he had mentioned. He did not add inerts; and he had the strongest possible objection to doing anything that would add a single per cent. more than was necessary. Prof. Cobb would tell the Committee in his evidence that, for ordinary purposes, the consumer was not prejudiced by a reasonable amount of inerts; but they were so much waste matter going through the mains, and it all had to be pumped. If there were 25 p.ct. of inerts in the gas, it would be necessary to have half as much pressure again to send the equivalent number of heat units through the pipes, than if there were no inerts. So that the cost of pumping the inerts meant a good deal to the gas authority. The Gas Light and Coke Company had two 48-in. mains coming to town from the Beckton works; and they were up to their limit of capacity. The effect of inerts was to limit the power of pumping; and if excessive inerts were put in and the calorific value of the gas dropped as well, it would be necessary to lay a third main at a cost of about £30,000 per mile, or else immensely increase the pumping powers.

The Chairman: Then you would think that 20 p.ct. would be a low maximum?

Mr. Goulden said he would not like to put any maximum at all. It was necessary to think not only of what could be done at the present time but in future. To put such a maximum even at the present time would mean that retorts would have to be repaired very much more frequently than he would regard as necessary; and the cost of repairs was exceedingly heavy—about three or three-and-a-half times greater than before the war; and he would very much deplore the extra expense involved, without any commensurate return to the consumer.

Referring to the effect of carbon dioxide,

The Chairman said he imagined that if there was an undue proportion it would correspondingly reduce the flame temperature.

Mr. Goulden said he agreed with Dr. Carpenter's figure of 10 p.ct. for carbon dioxide. He did not think that there would be any great lowering of the temperature of the flame with such a quantity, and the gas would have to be disgracefully made to have more, unless it was water gas or producer gas; and he had a strong objection to using producer gas for ordinary purposes.

The Chairman: You do not think it would be oppressive at all to limit the amount of carbon dioxide alone?—It depends entirely on what is to be the limit. I should have no objection to a limit of 10 p.ct. for carbon dioxide.

Do you think in any properly conducted works there is ever 10 p.ct. of carbon dioxide?—No, I do not.

Mr. Butterfield said he gathered that Mr. Goulden did not object to some limitation of inerts.

Mr. Goulden said he had just given his view as to carbon dioxide, but as to nitrogen, he did not think any limitation was necessary. There was already a very heavy percentage of nitrogen in gas, and Prof. Cobb would tell the Committee that the consumer was very little prejudiced. Nitrogen was a very difficult thing to deal with; and he preferred to be able to conduct the gas industry on commonsense business lines. Was a man who was going to charge by therms going to stuff his mains with a large proportion of material that was no good to himself or to anybody else? To do so would put a very heavy expense on the conduct of the undertaking; and surely this must re-act in such a manner as automatically to correct the behaviour of the gas authority. It would not be a wise policy to put restrictive regulations on the whole industry simply because two or three people throughout the whole country were inclined to use an undue proportion of inerts.

Mr. Butterfield suggested that if the limit were placed high enough, it would only effect these two or three people. He would like to know the limit that would not affect undertakings that were out to supply the best gas. He knew that a limit which would not affect the large London companies would be difficult for the smaller companies to comply with.

Mr. Goulden said that—starting-off with the statement that he objected to any limit—he would suggest a figure of 30 p.ct. to cover all inerts—*i.e.*, nitrogen, carbon dioxide, and oxygen. If the necessity for any limitation was clearly proved, he did not think any ordinary well-conducted works would be put under any hardship with a limit of 30 p.ct.

Mr. Butterfield mentioned that analyses of gas had been placed before the Committee which showed a proportion considerably higher than 30 p.ct.

Mr. Goulden said he had seen these analyses. The bulk of them were taken during war time; and as regards those that were taken after the war, it had to be remembered that the whole industry had been very badly hit with regard to labour. Indeed, he believed it would be three or four years before things became normal in this respect. If, therefore, a limit of 30 p.ct. were imposed, it should not come into force for a few years. Such a percentage he did not think would hurt the consumer, except perhaps in a few industrial cases. He did not know whether the Committee had had any figures with regard to industrial processes; but he had looked up some figures on the melting of copper. In the case of a 566 B.Th.U. gas, containing 18·4 p.ct. of inerts, including oxygen, the carbon monoxide being 6·3 p.ct., there was a total consumption of 8804 B.Th.U. to melt 8½ lbs. of metal. Taking a 495 B.Th.U. gas, made of a mixture of coal gas and water gas to the extent of 30 p.ct. of the latter, which contained 14·8 p.ct. of carbon monoxide, the total inerts of the mixed gas being 17·1 p.ct., 7920 heat units were required to do the same work. So that they actually got more thermal units from the poorer gas, because it took less heat to do the same work—due to the higher temperature on account of the larger percentage of carbon monoxide. Another gas of 492 B.Th.U., with 29·2 p.ct. of inerts, the carbon monoxide being 6·7 p.ct., was used in the same experiment; and it took 8647 heat units to melt the same quantity of metal. Yet another gas, this time 485 B.Th.U., with 13 p.ct. of carbon monoxide and a total of 21 p.ct. of inerts was taken; and the units required to melt the same quantity of copper were 8558. The temperature of the furnace was 1310° C. throughout. Another test was made in regard to hardening and tempering steel. He took some high-speed steel, and was able satisfactorily to harden and temper it at a temperature of 1356° C. This experiment, together with the previous ones, was interesting in showing that other things besides total inerts and the calorific value entered into the question. The proportion of carbon monoxide was an important factor. The furnace used was a small muffle-furnace, in which a crucible was placed. The gas was supplied at a pressure of 2 in.; and, in order to melt the copper, the temperature was maintained at 1310° C. throughout—the time taken being between 54 and 60 minutes.

Dr. Lander mentioned that complaints had been made that the time taken in heating operations had been greatly increased where the percentage of inerts had increased.

Mr. Goulden said that was all due to lack of pressure. When the calorific value was reduced, it was necessary to maintain a high pressure to provide the inducing force in the jet to take in the quantity of air required; and he believed that most of the troubles of the kind referred to were due more to this fact than to the drop in the calorific

value or an increase in the inerts. If he boosted-up the pressure, and got a good suction which took in the air, then he believed the results would be altogether different. All the evidence went to show that up to 30 p.ct. of inerts the consumer was not prejudiced; but he (witness) would qualify this by saying that that 30 p.ct. should not contain an excessive amount of carbon dioxide. He did not suggest, from the consumer's point of view, that the calorific value should be dropped and the inerts increased, because in that event specific gravity entered into the question. With 30 p.ct. of inerts and reasonable carbon dioxide, however, he did not believe the consumer would suffer.

Mr. Butterfield suggested that the effect of increasing the inerts, so far as the distributing system was concerned, as mentioned by Mr. Goulden, would be more noticeable in the case of large companies than small.

Mr. Goulden said that if the inerts were increased unduly, even a small works would have to increase the volume. It all depended upon the capacity of the mains; but pumping would have to be increased, and this would have a deterrent effect on small undertakings. Even if they laid a certain number of high-pressure pipes, it would mean pumping, which was very expensive, because the pressure increased so much more rapidly than the volume of gas delivered. To double the delivery meant an increase of the pressure by four times, so that it soon became a very onerous burden on the undertaking, and certainly not likely to encourage an increase of the inerts. He believed that economy in distribution would work towards hindering such a practice, because the price of gas was already high enough, and if it went any higher the industry would be very seriously prejudiced.

Mr. Butterfield asked if Mr. Goulden could give any information, from his experience of high-pressure gas, whether an increase of inerts made an appreciable difference to the light obtained.

Mr. Goulden said he was not sure whether he had any information, but he would send it along to the Committee if he had.

Mr. Butterfield said he would rather expect that any difference would first be noticeable in the high-pressure burners.

Mr. Goulden said that if he had not got the information, he would make some experiments.

Mr. Butterfield said it would not affect the general use of gas, for it was only in one or two districts that high-pressure gas was used.

Mr. Goulden said it was well known that a far greater difference in lighting efficiency could be obtained by very slight displacements of the mantle than by varying the proportion of inerts. This was shown by Prof. Cobb in the "Further Report to the Gas Investigation Committee of the Institution of Gas Engineers." [Mr. Goulden read out some of the results in that report, which has already been given in "Journal."] It was for this reason also that he maintained that 30 p.ct. of inerts would not prejudice the consumer.

Mr. Butterfield, referring to the previous statement made by witness—that he would not hesitate to introduce inerts of the nature of air during a time of emergency—said that this was not a case against inerts, because emergency matters were dealt with under section 9 (3) of the Gas Regulation Act.

Mr. Goulden said his point was that, limitation or not, if the works he had charge of were in such a state of emergency that he could not supply the B.Th.U. and pressure to enable the consumer to use the gas efficiently, then he would feel perfectly entitled to put in inerts altogether regardless of any regulations, and he should do so. This, however, was the only condition upon which he would countenance the wilful introduction of inerts.

Mr. Butterfield: Then you would drop your calorific value in such an emergency?—Yes; but it would not matter except as regards the delivery of volume. The air would have to be taken somewhere, and he should not interfere with the value of the gas.

No; but you would be delivering gas below your declared value?—Yes.

So that you would have to plead this provision of the Gas Regulation Act?—Yes, I should consider it my duty to the consumers to do so.

Asked as to whether he attached the same value to nitrogen and oxygen as to carbon dioxide,

Mr. Goulden said they were steadiers of combustion, and were not inerts in the ordinary way, and must be brought into the mixture in some way. Therefore, if any limitation of inerts was imposed, it should be independent of the air. But he did not want a wilful introduction; he could not agree with that. He regarded the oxygen and nitrogen as less prejudicial than a corresponding proportion of dead inerts, because it did not prejudice the behaviour of the British thermal unit.

The Committee here adjourned.

Wednesday, April 20.

Prof. J. W. Cobb, C.B.E., Livesey Professor of Coal Gas and Fuel Industries at the Leeds University, gave evidence to-day. He said that presumably the object of limiting, or proposing to limit, inerts was to prevent a falling-off (occasioned by their presence) in the possible efficiency in utilization of such heat units as were supplied. There was, however, no apparent object in restricting such additions to the gas as exert no adverse effect upon efficiency in use. Even if the presence of inerts did exert such an adverse effect in a particular gas, it might be to the advantage of producer and consumer alike that such a gas should be distributed if it could be shown that manufacturing economies accompanying the introduction of the inerts more than compensated for the diminished effectiveness in use of the gas per therm by a reduction in price which was thereby rendered possible. Apart altogether from this consideration, however, the question had been examined as to how far the useful effect of a therm carried in a public gas supply was influenced by the effect of inert constituents which the gas contained. The question had been investigated under his supervision for a Joint Committee of the Institution of Gas Engineers and the University of Leeds—with considerable thoroughness for heating and lighting (and others could testify as to power). The investigation was undertaken in the first instance for the information of the gas industry, because little or no reliable information on the subject was forthcoming, and opinions or impressions were very varied. Apart from experiments made on gases of different inert contents drawn straight from the works, special experiments were made by the deliberate successive addition of known quantities of nitrogen or carbon dioxide to a rich coal gas—the former being the dominating inert constituent in gas, and the latter another inert constituent always present, but in much smaller quantity. The influence of air additions was also tested. In the first experiments, the mixtures rich in nitrogen or carbon dioxide were obtained by over-pulling the retorts, or by the addition of Mond producer gas. But, although the information so obtained was quite interesting, it became evident on consideration that such a method could not lead very far without an indefinitely large number of experiments. When other constituents were always introduced alone with any one inert constituent, it was quite impossible to deduce any definite quantitative effect as attaching to the inert constituent alone. Moreover the number of possible mixtures containing nitrogen or carbon dioxide which could be introduced in practice was too great to allow. The investigation of them all (or most of them) in any reasonable time was impossible. Thus the nitrogen might be derived from:

(1) The coal.

(2) Air drawn in as such, containing one part of oxygen to four parts of nitrogen by volume.

(3) Flue gases mixed with an indeterminate excess of air drawn from the setting, and therefore containing carbon dioxide, steam, and oxygen, in addition to nitrogen. This would vary in composition, according to the kind of producer gas used for heating the setting.

(4) Nitrogen in water gas, accompanied by a very large excess of carbon monoxide, hydrogen, and carbon dioxide.

(5) Nitrogen contained in any gas used for the purpose of reducing the calorific value. Water gas would normally be used for this purpose; but if in special circumstances producer gas were used, its nitrogen content would vary from 44 to 66 p.ct., and the other accompanying gases would vary within wide limits. Thus, if it were Mond gas, the hydrogen would be 27 p.ct.; the carbon monoxide, 10 to 12 p.ct.; and the carbon dioxide, 16 to 18 p.ct. If run with little steam, the proportions of carbon dioxide and hydrogen would be reversed. The carbon dioxide would be reduced to 6 or 7 p.ct., while with a coke-fired generator, using no steam, very little hydrogen would be present. Similar complication accompanied the introduction of carbon dioxide. It came from a number of sources in a number of mixtures. It was plain, therefore, that the only practical way of proceeding in order to get the effect of any one inert constituent on a coal gas was to start with such a gas very low in inert constituents, and add in successive portions the particular inert constituent being studied. And although preliminary information was secured by previous experiments, the greatest value was attached to the results obtained in this way. The gas mixtures were tested in various appliances covering a wide range of uses—particularly those for which large quantities of gas were consumed.

(*a*) *Low-Temperature Heating.*

For low-temperature use, the tests were made on water heating. As a result, it could be taken as established that for such low-temperature operations, the quantity of inerts present, even up to the producer gas composition, was of no consequence.

(*b*) *Higher Temperature Heating.*

For this the gas-fire was taken as typical. Different grades of gas were compared by the determination of the radiant efficiency obtained from them in a gas-fire—*i.e.*, the percentage of their total heat of combustion emitted as radiant heat. This was a stringent test, because the corresponding differences in total efficiency would be smaller. Mond gas yielded 36 to 37 p.ct. of radiant efficiency, although of only 150 B.Th.U. gross, and carrying 60 p.ct. of inerts, of which 15 p.ct. was carbon dioxide. There was, therefore, no fear of any serious drop in the radiant efficiency of gas-fires for any gas of which there was any reasonable possibility of manufacture and distribution. With rich gas, above 550 B.Th.U. gross, greater care was necessary in the adjustment of the fire, and a higher pressure, in order to develop the full efficiency. This was probably because of the greater difficulty of securing intimate admixture of gas and air, and because the smaller quantity of such gas used had less momentum available for injecting the large air supply necessary for the best results. The same applied to the use of rich gas in lighting.

(*c*) *Lighting.*

This was a very special use of gas, in which only a small proportion of the high temperature radiation was effective. Theoretically, efficiency for lighting might be supposed to be determined by flame temperature; and no doubt it was an important factor, but only one of several. The injecting power of the gas employed, its complete admixture with air, and the degree to which the flame fits the mantle, all come into play in determining the result. Under laboratory conditions with adjustments made as carefully as possible, the gradual falling-off due to the presence of nitrogen (and carbon dioxide) could be traced; but it was very slight over a considerable interval, and only to be detected by adjustment and observation of a kind unattainable in ordinary use. Thus with gas containing—

4·5 p.ct. of nitrogen and 6·8 p.ct. of total inerts, the candle power was 73·5 p.ct.
5·6 p.ct. of nitrogen and 17·7 p.ct. of total inerts, the candle power was 71·5 p.ct.
24·6 p.ct. of nitrogen and 26·5 p.ct. of total inerts, the candle power was 70·0 p.ct.

The supply was at the rate of 2000 B.Th.U. per hour—normal, or a little low for the "C" mantle used. The problem was to determine at what point the drop was sufficient to be regarded as of practical importance when the falling-away from a satisfactory standard of efficiency and illumination could be regarded as established. For this purpose he adopted as a criterion that good illuminating power required the attainment of 70-candle power with the ordinary "C" mantle, and good efficiency required the production of 30-candle power per 1000 B.Th.U. per hour delivered. There could be added 35 p.ct of nitrogen or 10 p.ct. of carbon dioxide before these standards ceased to be attained. It should be noted that the percentage of

carbon dioxide present should hardly ever in normal practice exceed 5 p.ct., even when the total inerts were high. Where the proportion of gas used for lighting was very small, and the maximum illumination available from the ordinary burner need only be considered (the thermal efficiency being ignored), these figures were altered. All gases up to 46 p.ct. of nitrogen or 23 p.ct. of carbon dioxide would then meet the requirement. Air had a special position. In gas-fire tests no adverse effect of 34 p.ct. of admixed air could be detected. In lighting, the percentage of air was raised by stages to 41·6 p.ct. without showing any adverse effect on the attainable lighting power or the thermal efficiency. With rich coal gas the admixture of air was an advantage. These remarks on the harmlessness of air addition were limited strictly to its thermal effects. What had been borne in upon them very strongly by their experiments had been that bad results were more likely in practice to come from a variation in gas quality unaccompanied by a corresponding adjustment of the appliances than from any inherent property attaching to a particular grade of gas when the quality was maintained. This was no doubt the reason for many difficulties experienced in the past with gas in use—particularly in times of stress; and it was guarded against by the provisions of the new Act.

(d) Metal Heating Furnaces, &c.

These had not yet been tested, mainly because of the great difficulty of choosing any one furnace which could be regarded as typical, and also because of the difficulty of getting and storing sufficiently large supplies of the gas mixtures required for the tests. Individual experiences might be useful therefor. He had regularly used gas containing inerts ranging from 20 to 30 p.ct. for attaining very high temperatures, in the testing of refractory materials, fire-bricks, silica, &c. He had experienced no difficulty, but had to enlarge slightly the nipple of the burner designed for richer gas.

As another relevant experience of his own, he mentioned that a firm using coal gas in a crucible furnace for melting copper and alloys consulted him recently about their heavy expenditure for gas which contained 25 to 30 p.ct. of inerts. They were inclined to blame the gas; but he had a letter from them the other day in which they said that they were now getting quite excellent results in every way, and that the indifferent results in the past were plainly not due to the unsuitable quality of the gas but to the furnaces they used. They added, "This bears out your opinion."

Discussing the differences between inerts, Prof. Cobb said it would be very difficult to specify a figure for inerts which would be just in taking into account the quantitative difference between the effects of the same volume of the different constituents which make up the total inerts. Thus, over a wide range, oxygen exerted no thermal deteriorating effect; indeed it cancelled the effect of four times its volume of nitrogen. Moreover if they compared nitrogen and carbon dioxide, as soon as they were present in quantity sufficient to exert any appreciable deteriorating effect, 1 p.ct. of carbon dioxide had approximately the same effect as 2·5 p.ct. of nitrogen. He did not think any formula could be applied with confidence to the results—even if nitrogen, carbon dioxide, and oxygen were all determined by analysis—apart from the difficulty of making and using the analysis for penalty purposes.

As to the possibilities of present practice, he said that gas-works continued to be very heavily loaded, on account of the increasing demand for gas; and it would appear they were likely to be so for some years to come. As to what was the practicable limit as regards inerts for working at the present time, he would rather not speak, but left it to engineers and managers with day-to-day experience. It was, however, fundamental and obvious that enlightened self-interest would prevent a manager from incurring works and particularly distribution costs on an inert constituent for which he would receive no payment. Moreover, the exclusion of the portion of the inerts which comes from over-pulling at the retorts would be secured (as far as practicable) by the same motive of self-interest, because the drawing in of free oxygen and its accompanying nitrogen lowered the ammonia yield very quickly and deteriorated the tar.

The new Act was intended to allow and encourage the development of gas technique on all lines that tended to fuel economy. What particular processes old and new would be involved it was impossible to forecast; but it was plainly advisable to guard against unnecessary legislative prohibition which would tell against progress. If, for example, low temperature carbonization succeeded, and a gas was made of 800 B.Th.U., it would be very desirable to let it down before distribution and use. One possible way would be to add a Mond producer gas made from the soft small coke, recovering ammonia; and if so, the inerts would be high, since the diluent gas would contain at least 44 to 46 p.ct. of nitrogen, and 16 p.ct. of carbon dioxide—some 62 p.ct. of inerts. If the rich gas contained 10 p.ct. of inerts, and it was mixed with an equal volume of producer gas of 140 B.Th.U. calorific value and containing 62 p.ct. of inerts, the mixture would have a calorific value of 470 B.Th.U., and an inerts content of 36 p.ct. Again, if a gas-works was carbonizing rich coal, making a gas of (say) 650 B.Th.U. gross, and was heating its retorts from bye-product producers, it might very well desire to let-down its gas in the same way with a similar result. If the mixture made was a 480 B.Th.U. gas, the inerts would be 27 p.ct. Apart altogether from such additions of producer gas with high inerts, there was an undoubted field for fuel economy in the utilization of coke-oven gas for the purpose of public supply. It would, however, be exceedingly difficult for a gas supplying authority to fix-up a contract with a coke-oven firm for taking its gas, if there were too strict a limitation of the inerts in the coke-oven gas. It would, of course, be in the interests of the gas manager to get his coke-oven supply of as good and regular a quality as possible; and a limitation of inerts would introduce a difficulty which he would have to meet. It might act as a deterrent to his using coke-oven gas at all. This would tend to discourage fuel economy by encouraging gas managers to play for safety in using only the gas made from apparatus under his direct control.

Summarizing on the basis of the considerations outlined, what he should feel inclined to recommend would be the suspension of any clause as regards inerts for a period of years, at the end of which time the operation of the Act would be better understood, and steps could be taken to enforce any necessary prohibitions on the basis of acquired experience.

The CHAIRMAN said he gathered that the conclusion come to, as the result of the low-temperature experiments, was that inerts had practically no effect.

Prof. COBB said that was so. The inerts went from nothing to 60 p.ct. in the case of Mond gas (in the extreme case); and all the evidence went to show that inerts were more or less negligible in the case of low-temperature heating.

Dr. LANDER asked if the same proportionate efficiency was to be expected when a gas-fire was turned-down as compared with when it was burning to the full, as was the case with the experiments referred to by Prof. Cobb.

Prof. COBB said there were a large number of figures in the report, and no doubt the efficiency was in proportion to whether the fires were burned at the full or half.

The CHAIRMAN, referring to the lighting experiments mentioned, said that apparently there was only a difference of 3 candle power as between 6 8 and 26 p.ct. of inerts. Was this with the same adjustment on the same burner?

Prof. COBB said that the adjustments were made in the laboratory, and were very much more exact than could be made by the consumer; but the adjustment was easier, in order to get the best results, with a certain percentage of inerts than it was with a very low percentage of inerts.

The CHAIRMAN drew attention to the statement made by Prof. Cobb that "these remarks on the harmlessness of air addition are limited strictly to its thermal effects," and asked if Prof. Cobb had some other effect in his mind.

Prof. COBB replied that he was not sure that it was a matter which concerned the Committee; but what he meant was that there were the questions of corrosion of mains and things of that kind which must be taken into account when discussing the comparative usefulness of gas containing air.

The CHAIRMAN said he was not so sure that such matters might not have to be taken into account by the Committee in advising whether the inerts should be limited.

Prof. COBB: I can give you no information on that matter; it is rather obscure. But I wanted to point out that it was a consideration that might come in. Continuing, Prof. Cobb said that no experiments had been carried out on metal heating. It had been desired to carry out such experiments, but there were too many things to do, and there were difficulties in the way of deciding upon a furnace which might be taken as typical, or any one operation which might be regarded as typical. There was also the difficulty of getting a sufficiently large quantity of mixture for such experiments with furnaces. It was a comparatively easy matter for a gas-fire, and quite easy for lighting, because the quantities of gas required were small; but as soon as they came to furnaces, the quantities required were very large, and the preparation and storage of the mixtures became difficult. It was hoped, however, to carry out experiments of this kind.

Mr. BUTTERFIELD asked whether the experiments on low-temperature heating suggested that one grade of gas was more sensitive to fluctuations than another.

Prof. COBB said there was no reason to suppose that there was any greater sensitiveness. For instance, there was nothing to show that a 450 or 500 B.Th.U. gas was more sensitive to slight variations, as regards rate of consumption, than a 300 or 400 B.Th.U. gas. Generally speaking, the same remark would apply to lighting, although perhaps the leaner gases here had an advantage because of the superior injecting power, in the sense that even with variations it was easy to maintain full aeration. The experiments on lighting were with the upright burner, and none were with the inverted burner; but there was no reason to suppose that the results with the inverted burner would be different. He should think the results would be of the same order if inverted burners had been used, although he would not go so far as to say that they would be exactly the same. There was no reason to suppose that the falling-off would be less in the case of the inverted burner with increased inerts than had been shown to be the case with the upright burner.

Discussing with Mr. Butterfield pressure in relation to inerts,

Prof. COBB said the pressure was increased during the experiments more for convenience than for anything else. Supposing they were using a gas containing more inerts, and it was necessary to send more gas through in order to get the same number of therms, there were two ways in which this could be done. One was by increasing the size of the nipple, and the other was to raise the pressure somewhat. It had been proved that enlarging the nipple without increasing the pressure was in many cases quite effective. It would not be effective were it not for the fact that the gases with the higher inerts required less air, and there was still the injecting power of the air to get sufficient volume through. In this way it was possible to work with almost any grade of gas without increasing the pressure.

Mr. BUTTERFIELD: Even taking into account specific gravity?

Prof. COBB said "Yes;" specific gravity would be allowed for by widening the nipple. He agreed, however, that it might be a disadvantage to the consumer if his service pipes were working up to their full capacity, to have additional air in the gas. He did not see that one broad limit for all incombustibles could be justified, and he would draw a distinction between oxygen, nitrogen, and carbon dioxide.

Mr. BUTTERFIELD: But on the other hand, it would destroy the latitude to the gas undertakings to use different methods of breaking-down rich gas, if a limit were imposed on the carbon dioxide, unless the limit was very high. It would almost preclude the use of Mond gas, for instance?—Yes, I think it would.

And yet carbon dioxide is the most deleterious iner ?—Undoubtedly.

Prof. COBB added that he thought it would be inadvisable to make any restriction which might have an effect that could not be foreseen at present, because there were one or two cases in which the addition of Mond gas might come about very rationally in working out a scheme for gas manufacture.

Mr. BUTTERFIELD: You mean proportions of rich gas and Mond gas?—Yes, I suggest that, because such a gas would give a richness comparable with many public supplies.

But that might be extended if the soft coke from the process proved unsaleable. A much larger proportion of Mond gas might then be used and a lower declared calorific value adopted?—That might be so.

And then you would get very much higher inerts?—Quite.

May I come to the corresponding case in which a gas undertaking has very little sale for its gas coke, and proceeds to utilize it in an ordinary producer, and mixes the gas with its coal gas, going for a complete gasification plant, and declares a low calorific value—say, 325 or something like that. Would the inerts in the case of such a mixture, in your opinion, be as damaging to the consumer compared with a supply of slightly enriched blue water gas?—If you are assuming that it is producer gas made on the gas-works, I do not think so.

It is open, as you know, to any gas undertaking to declare an extremely low calorific value—anything between 300 and 350 B.Th.U., say. I should like your definite opinion as to whether, if the gas contains a high proportion of inerts, it is less valuable to the consumer than a slightly enriched blue water gas which would have a very low proportion of inerts also?—I would not care to answer that question confidently; but in an extreme case high inerts might be prejudicial to the consumer. At the same time, I think an extreme case such as you mention is very unlikely, for the fundamental reason that distribution costs would increase.

Asked as to what he thought would happen if the undertaking could not dispose of its coke,

Prof. COBB said that was a commercial probability which he could not calculate. He could see it was a possible contingency; but he would prefer to wait and find out if anything of the sort really took place before taking any action. It seemed rather too remote a possibility at present for any legislative action to be taken. He agreed with Mr. Butterfield that there was one town where gas of 325 B.Th.U. had been distributed.

Mr. BUTTERFIELD: I feel sure the Committee would be glad to have your views as to whether a consumer suffers in any way with such a gas having high inerts compared with gas of a similar calorific value and having lower inerts.

Prof. COBB replied that he did not know enough definitely to reply, but he believed they would be quite safe in taking it for granted that the case to which Mr. Butterfield had referred (as supplying a 325 B.Th.U. gas with high inerts) was not one which appealed to the gas industry as an example. As to the period of time before any limitation should come into use, he had no period in his mind when making his statement.

The CHAIRMAN: I think what Prof. Cobb means is that experience may be quickly got or it may be obtained over a long period; and I assume the period of time would depend on the kind of experience that one has to enable us to come to a conclusion.

Prof. COBB said that that was the only way he could look at it, and it was why he had suggested that we should wait a little before imposing restrictions.

Dr. LANDER referred to the railway companies' evidence, and asked if Prof. Cobb could explain why the railway companies drew different inferences from the work of the Gas Investigation Committee than did the Committee itself. For instance, the railway companies suggested that the falling-off in candle power with increase of inerts was much greater than was suggested in the Gas Investigation Committee's report, taking the figures given in that report.

Prof. COBB said the falling-off in candle power due to increasing inerts was at first very slight; it got bigger at the end. But it was necessary to fix precisely the point at which the falling-away might be regarded as of practical importance. In order to do so, a criterion must be taken with regard to general practice and experience; and the Committee consulted a number of people as to what was reasonable. The conclusion was come to that 70-candle power was a satisfactory standard of performance with the normal No. 3 mantle.

Dr. LANDER said the point was that the Gas Investigation Committee claimed certain things for their results, and the railway companies said they showed different results. He was wondering whether Prof. Cobb could give the Committee his opinion as to the validity of the effects claimed by the railway companies.

Prof. COBB said that the railway companies had deduced from the report more than the Committee itself had ventured to. There was necessarily a lack of precision about results of this kind that would prevent one going so far, quantitatively, in deduction as the railway companies had done. Certainly the Gas Investigation Committee did not feel justified in going so far as the railway companies had in their evidence. He regarded the differences shown in the results with varying inerts as so small as to render unjustifiable the conclusions come to by the railway companies.

Mr. BUTTERFIELD mentioned that the object of the railway companies was to get the same candle power from different burners at every railway station with the same pipes; and he gathered from Prof. Cobb that whatever was done, this could not always be ensured.

The CHAIRMAN: You cannot get the temperature?

Prof. COBB: No. Continuing, he said that if the railway companies wanted a high candle power from the "C" burner, then they would be right in maintaining that it could not be done with a gas containing a high percentage of inerts. They would have to alter the mantles or the burners.

Dr. LANDER asked if it would not be justifiable to retain an inerts clause—even assuming the Committee were perfectly satisfied that as long as the same calorific value was supplied the inerts were of no account—because of the effect of such a clause in controlling variations of specific gravity, and so ensuring that the consumer should get a fairly uniform density. This might, perhaps, be an endeavour to visualize what did not exist at present to a very great extent. But in the case of an industrial user he might be prejudiced if the specific gravity varied. The evidence of the Sheffield people rather suggested that their troubles might be due to this, because they stated that even after the appliances had been adjusted the difficulties persisted.

Prof. COBB asked if the difficulties at Sheffield had been definitely traced to gases in which the calorific value had been maintained and the specific gravity had not.

Dr. LANDER said he did not think they could go so far as that, because the figures showed variations in both calorific value and specific gravity. But it was possible to visualize cases where the specific gravity might alter. Would Prof. Cobb state whether he thought this a possibility or a probability?

Prof. COBB thought it might be a possibility, but not a probability. Then, it would affect the amount of gas delivered in the same way as an alteration of pressure affected it. Substantially, a difference in density was the same sort of difference as obtained with a fluctuating pressure.

Dr. LANDER: Would it, as a fact, solve some of the consumers' difficulties if a maximum percentage variation of specific gravity were included, and would this be a difficult obligation on the gas companies now that recording instruments for the purpose can be obtained?

Prof. COBB said that, accepting Dr. Lander's assurance that such recording instruments could be obtained, he still thought it would be an unnecessary complication at this stage, although it was quite the kind of thing which might be considered if his suggestion of waiting a period to see how things developed were adopted.

The Committee then adjourned until Wednesday, April 27 (to-day), when evidence will be given by Sir Dugald Clerk.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" of applications by gas undertakings to the Board of Trade for Orders under the Gas Regulation Act.

Burgess Hill and St. John's Common Gas Company.

The maximum price now authorized in respect of the supply of gas by the undertakers is 5s. 6d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 8d. per therm.

Chepstow Gas Company.

The maximum price now authorized in respect of the supply of gas by the undertakers is 5s. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 2s. per therm.

Chester United Gas Company.

The maximum prices now authorized in respect of the supply of gas by the undertakers are 4s. 6d. per 1000 c.ft. within the city and borough of Chester, and 5s. per 1000 c.ft. within any other part of the limits of supply which is beyond the limits of the city and borough. The prices which the undertakers have asked the Board of Trade to substitute for these are 1s. 6·58d. per therm within the city and borough of Chester, and 1s. 7·78d. per therm within any other part of the limits of supply which is beyond the limits of the city and borough.

Folkestone Gas and Coke Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 3s. 4d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 6d. per therm, with an addition of 1d. per therm in respect of gas supplied in Hythe and Saltwood until July, 1926, in substitution for an addition of 6d. per 1000 c.ft.

Great Grimsby Gas Company.

The maximum price now authorized in respect of the supply of gas by the undertakers is in certain parishes 3s. 9d. per 1000 c.ft., and in others 4s. 3d.; and the prices they have asked the Board of Trade to substitute for these are 1s. 5·3d. and 1s. 7·3d. per therm.

Henley-on-Thames Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 4s. 4d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 5d. per therm.

King's Lynn Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 3s. 6d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 5d. per therm.

Raunds Gas Light and Coke Company, Ltd.

The maximum price now authorized in respect of the supply of gas by the undertakers is 4s. 9d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 5d. per therm.

Rossendale Union Gas Company.

The maximum price now authorized in respect of the supply of gas by the undertakers is 5s. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 8d. per therm.

Sutton Gas Company.

The standard prices now authorized in respect of the supply of gas by the undertakers are (1) 3s. 2d. per 1000 c.ft. in the parishes of Sutton and Cheam (except in the portion of the last-named parish referred to in section 38 of the Sutton Gas Act, 1904, as "Worcester Park"); and (2) 3s. 8d. per 1000 c.ft. in the parish of Banstead and in the said portion of the parish of Cheam referred to as Worcester Park. The prices which the undertakers have asked the Board of Trade to substitute for these prices are 1s. 3·8d. per therm for the price of 3s. 2d. per 1000 c.ft., and 1s. 5d. per therm for the price of 3s. 8d. per 1000 c.ft.

Wellington (Salop) Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 3s. 9d. per 1000 c.ft; and the price they have asked the Board of Trade to substitute for this is 1s. 5d. per therm.

DECLARATIONS OF CALORIFIC POWER.

The following Companies, having obtained Orders, have intimated the calorific power of the gas they intend to supply.

Ashton-under-Lyne Gas Company.—500 B.Th.U. (April 25).
Commercial Gas Company.—475 B.Th.U. (May 1).
Hornsey Gas Company.—470 B.Th.U. (May 1).
Oxford Gas Light and Coke Company.—460 B.Th.U. (May 1).
South Suburban Gas Company.—460 B.Th.U. (April 23).

SPECIAL ORDER.

Redhill Gas Company.

Application has been made by the Company to the Board of Trade under section 10 of the Act, to enable them to acquire the undertaking of the Reigate Gas Company, Ltd., to issue cumulative preference stock in payment, and for other purposes.

GAS REGULATION ACT ORDERS.

There have been received from the Director of Gas Administration, Board of Trade, copies of the following further Orders made under section 1 of the Gas Regulation Act. The parts applying specially to the Companies named, and the date of coming into operation, are noted.

South Suburban Gas Company.

After the declared date,

(*a*) The standard price in respect of gas supplied by the undertakers shall be 15d. per therm.

(*b*) The sum of one-fifth of a penny per therm shall be substituted for the sum of one penny per 1000 c.ft. mentioned in sub-section (2) of section 35 of the South Suburban Gas Act, 1912 (2 and 3 Geo. 5, c. 90), in this section referred to as the "Act of 1912;"

(*c*) The words "per therm" shall be substituted for the words "per 1000 c.ft." whenever they occur in sub-section (1) of section 36 of the Act of 1912;

(*d*) The sum of two-and-four-fifths pence shall be substituted for the sum of one shilling and twopence mentioned in paragraph (ii) of sub-section (1) of section 36 of the Act of 1912;

(*e*) The sum of one-and-two-fifths pence shall be substituted for the sum of sevenpence mentioned in paragraph (iii) of sub-section (1) of section 36 of the Act of 1912;

(*f*) The sum of one-fifth of a penny per therm shall be substituted for the sum of one penny per 1000 c.ft. mentioned in sub-section (2) of section 36 of the Act of 1912;

(*g*) The words "per therm" shall be substituted for the words "per 1000 c.ft." whenever they occur in sub-section (3) of section 37 of the Act of 1912;

(*h*) The words "per therm" shall be substituted for the words "per 1000 c.ft." whenever they occur in sub-section (1) of section 30 of the South Suburban Gas Act 1918 (8 and 9 Geo. 5, c. 62), and the sum of two-fifths of a penny shall be substituted for the sum of twopence mentioned in that sub-section.

For the purpose of ascertaining the authorized rate of dividend for the half year in which the declared date occurs the price charged per 1000 c.ft. during that part of the half year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-four-fifths. [April 21.]

Tottenham District Light, Heat, and Power Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 17·6d. per therm.

For the purpose of ascertaining the authorized rate of dividend for the half year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the half year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-seven-tenths. [April 20.]

PATENT OFFICE REPORT.

The thirty-eighth report of the Comptroller-General of Patents (Mr W. Temple Franks), which was issued last week, states that the number of applications for patents received last year was 36,672. This is by far the largest number received in any one year, and compares with 32,853 in 1919, and 21,839 in 1918. The patents sealed numbered 14,191 in 1920, 12,301 in 1919, and 10,809 in 1918. The complete specifications filed numbered 21,796, or 2874 more than in 1919.

The receipts from patent fees last year amounted to £420,472. By the Patents Rules, 1920, certain new fees were imposed, including fees of £15 and £16 for the fifteenth and sixteenth year of a patent; and existing fees were increased in a few cases. The sum received from renewal fees again increased; the figures being £286,498, as compared with £247,408 in 1919. This increase was largely due to belated payments under the Treaties of Peace with Germany and Austria.

Under section 2 of the Act of 1919, which came into operation on April 1, 196 requests for indorsement of patents were received. In the great majority of these cases indorsements have been effected. The number of applications made for the restoration of patents which had lapsed in consequence of the non-payment of renewal fees was two. In one case the patent was restored, while the second application was withdrawn. Under the provisions of section 26, which empowers the Comptroller to revoke a patent upon application made within two years from the date of the patent by any person who would have been entitled to oppose its grant, there were seventeen applications covering sixteen patents. There were four offers received to surrender patents. The number of hearings upon oppositions to the grant of patents was 43, as compared with 55 in 1919. Under section 18 of the Acts, ten applications by originating summons for extension of term of patents were lodged, covering 27 patents. In four instances (covering six patents) extensions have been granted—four years, five years, and three-and-a-half years. One application was refused; and several are still pending. There are now eleven patents in force which have been prolonged beyond the normal period.

The names of 68 patent agents were added to the register during the year, mostly as the result of applications under the Register of Patent Agents Rules, 1920. The number on the register at Dec. 31 was 309. The rules referred to came into force on Jan. 31.

No Triple Alliance.

THERE is no Triple Alliance between the gas connection, draw-off cock and flue outlet on Main's "LAUNDRESS" Boiler. Each is entirely independent and can be set at the most convenient angle and the most suitable place irrespective of the position of the others. Easy and economical to fix.

R. & A. MAIN, LTD.

EDMONTON, N. 18, FALKIRK, &c.

STOCKTON GAS-WORKS EXTENSIONS.

Mr. A. W. Brightmore conducted a Ministry of Health inquiry at Stockton-on-Tees, last Thursday, into an application by the Corporation to borrow £50,072 for gas-works improvements. The work needed to be done consists principally of new horizontal retorts and purifying plant; and it was stated that the scheme would automatically dovetail into proposals for extensions.

The Town Clerk (Mr. T. Downey) said that in 1914 the then Manager drew attention to the immediate necessity of extending the carbonizing plant and installing additional purifiers. The war, however, led to the proposed work being deferred. If the new plant was needed in 1914, it was much more urgently required at the present time. Mr. W. W. Atley (the Manager) had recommended a form of horizontal retorts, and sanction had been obtained to borrow a portion of the money. At the time, the Committee hoped to pay the balance out of revenue; but this was found impossible. The capacity of the existing carbonizing plant of nineteen beds of horizontal retorts was 1,600,000 c.ft. a day; and there was a water-gas plant of 600,000 c.ft. capacity. The purifying apparatus could deal with 2,000,000 c.ft. in 24 hours; and with the coal-gas and water-gas plants in operation, the purifiers were not equal to the demand. With the new horizontals installed, there would be eight beds, capable of making 1,750,000 c.ft. daily; and, in addition, ten of the other beds, capable of producing 800,000 c.ft., would be available, together with the water-gas plant—giving a total capacity of 3,150,000 c.ft. daily. In 1914, the make of gas was 424,000,000 c.ft., and last year it was 528,000,000 c.ft. Under the proposed scheme, the purifying plant would be able to deal with 4,800,000 c.ft. of gas per day.

Mr. W. W. Atley (the Gas Manager) stated that the cost of the work to be let by tender was £37,390. Departmentally, he was carrying out work which would cost £13,905, but which would have cost £20,355 on an outside contract. The £51,295 estimated in all would, he anticipated, cover the full cost of installation. Last winter the purifying plant was far from equal to the demands made upon it; and so serious was the position, owing to abnormal consumption, that he had to depend upon the water gas, instead of keeping it merely as a stand-by, which he desired to do. The present scheme would meet the demands for several years.

Mr. Downey, explaining what led the Committee to ask for sanction to borrow the whole of the money, stated that on Sept. 30 last the Gas Department had a balance in hand of £17,854; and the proposal to pay a portion of the cost out of revenue appeared to be well founded. The slump then came; and the estimated profit of about £18,000 went down to £2400. At one period as much as £12 a ton was being obtained for exported coke; and the average price was from £8 to £10—400 tons a week being dealt with. The contract had been let to Messrs. Ashmore, Benson, Pease, & Co., of Stockton, and would therefore provide a substantial amount of employment for the men of the town.

STAFFORD'S GAS UNDERTAKING PROGRESS.

Manager and Milking of Profits.

The wonderful progress of the gas undertaking of the Stafford Corporation under the managership of Mr. W. M. Valon, who has just resigned his post to take up an important appointment with Messrs. Major and Co., chemical distillers and dye makers, of Hull, was testified to at a gathering held at Stafford last Saturday evening, at which Mr. Valon was presented with a portable typewriter from the staff and employees of the Corporation Gas and Electricity Departments.

The chair was occupied by Alderman R. J. Young (the Chairman of the Gas Committee); and the presentation was made by Alderman T. Westhead, the former Chairman, who paid a high tribute to Mr. Valon's management and engineering skill, and to the good feeling which had existed between him and the staff. Alderman Westhead recalled that, when Mr. Valon came to Stafford ten or eleven years ago, the output of the works was something like 200 million c.ft., whereas to-day it was 350 millions; and the value of the sales in the same period had gone up from £38,000 to £96,000. Referring to the additions to the plant during Mr. Valon's *régime*, he mentioned as outstanding features the installation of the vertical retorts, which had proved a great boon to the town, and the more recent provision of a million c.ft. holder. New purifiers were now being put in; and when this work was completed, he thought they would be practically perfect in their plant. He did not believe any works in a town of the size of Stafford had made more progress than theirs had. They had a good man—Mr. T. H. Poulson—in Mr. Valon's place; and he hoped he would achieve the same success, and have the same loyal support.

In acknowledging the gift, Mr. Valon referred to a tendency in many towns to milk the gas and electricity undertakings for profits, and said this was one of the dangers of communities running their own concerns. If they worked an undertaking for the benefit of the community, it should be run in the right way, so that the gas was as cheap as possible, and not keep up the price with a view to making profits to be handed over to other departments. The only way to encourage the people to use gas for all and every purpose was to let them have it as cheaply as possible. Stafford, he said, had an undertaking of which it might well be proud; and but for the vertical retorts, they would not be getting through the strike period so well as they were. He appealed to the staff to give his successor the same loyal support as they had accorded him.

In submitting the health of the members of the Gas and Electricity Committee, Mr. Valon spoke of the far-sighted policy they had adopted. When the Corporation took over the works, at a cost of £76,000, they were capable of making 70 million c.ft.; but now they were producing something like 400 millions. The capital expenditure was less than the original cost of the works; a great deal of the extension work having been done out of revenue. In addition, the Cor-

USE Simmance's

DEAD BEAT INDICATORS

instead of WATER-TUBE GAUGES and

"READ THE PRESSURE BY THE POINTER."

No liquid to evaporate and no levels to adjust.

No glasses to break and nothing to clean.

Direct reading, Open scale, Any range (Pressure, Vacuum, or Combination).

Incorrodible, Accurate, for foul or purified gas.

MADE IN MANY RANGES WITH TABLETS LETTERED AS DESIRED.

ALEXANDER WRIGHT & CO., LTD., WESTMINSTER.

Agents: Australia—FYVIE & STEWART, 360, Collins St., Melbourne; Canada—W. P. ROPER, 502, Merchants' Bank Building, Montreal.

poration had received about £78,000 towards the relief of the rates. The result of the Committee's policy was that they had works equal to any in the country. With the new purifiers they would be equal to any in the world; and he looked forward to them being able to sell the cheapest gas in the country.

The Mayor (Councillor R. E. Meade), who was formerly Engineer at the Corporation electricity works, responded to the toast.

Dr. Cyril Banks (Medical Officer of Health) proposed the health of the new Manager, and acclaimed him as a worthy successor to Mr. Valon.

Mr. Laurence Caulfield, a member of the fittings staff, who has secured an appointment with the permanent Civil Service, was at the same gathering presented with a handsome watch.

TRADE NOTES.

[For "Journal" Advertisers.]

A Big Tar Distilling Business.

The business of Messrs. Burt, Boulton, and Haywood, Ltd. (whose Chairman is Captain Sir Harold Boulton, Bart., C.V.O., C.B.E., M.A., J.P.), includes, among other important branches, the distillation of coal tar and the manufacture of the following products: Sulphate of ammonia, motor benzole, 90 p.ct. and pure benzole, 90 p.ct. and pure toluol, solvent naphtha 90-95 at 160° C., heavy naphtha 90 p.ct. at 190° C., crude carbolic acid, cresylic acid, dark and pale, pyridine bases, sharp oils, creosotes (various grades), naphthalene, crude and refined, heavy oils (for the manufacture of lubricants), fuel and Diesel oils, refined and dehydrated tars, black varnishes, anthracene, carbazole, pitch, &c. Messrs. Burt, Boulton, and Hayward have also large interests in various other important firms, including the Dominion Tar and Chemical Company, Ltd., who have tar works at Montreal, Sydney, and Sault St. Marie; the Canada Creosoting Company, Ltd.; the Neath Abbey Tar Distilleries, Glam. (in course of formation); and the Compagnie Belge des Produits Chimiques de Schoonaerde, Brussels.

Foreign Gas-Mantles.—The Hammersmith Borough Council report receipt of a communication from the Joint Industrial Council for the Gas-Mantle Manufacturing Industry, calling attention to the amount of unemployment and harm that is occurring to the industry through the use of foreign mantles in this country. It is pointed out that these mantles are being very largely imported from the country of our late enemy, and, owing to the rate of exchange, are being offered very much cheaper than the costs of the British manufacturer. The circular sets out details of the serious effects upon the industry, and asks that, in these circumstances, only mantles of British manufacture be purchased.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *April* 26.

There is no change to report in the London tar products market; prices remaining purely nominal.

Sulphate of ammonia is unaltered.

Tar Products in the Provinces.

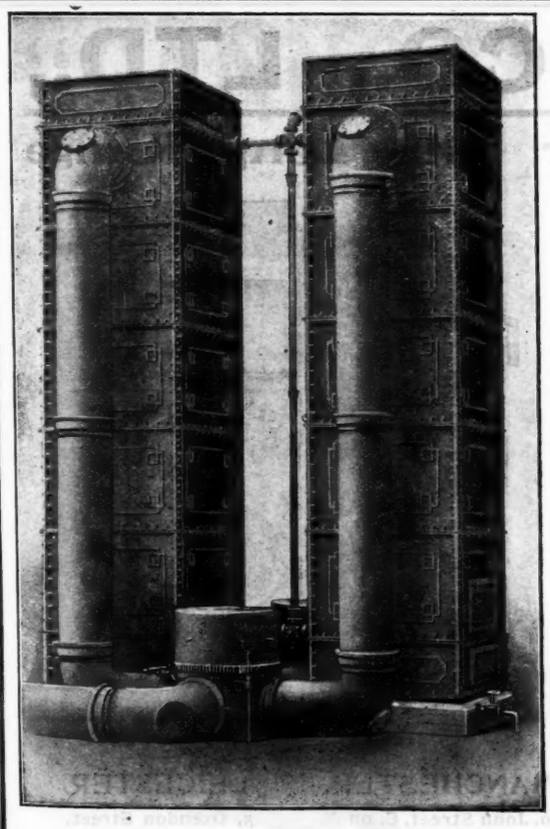
April 25.

The average values for gas-works products during the week were: Gas-works coal tar, 59s. to 64s. Pitch, East Coast, 55s. to 60s. per ton f.a.s.; West Coast—Manchester, 55s. to 60s.; Liverpool, 55s. to 60s.; Clyde, 55s. to 60s. Benzole 90 p.ct. North, 2s. 10d. to 3s.; crude 65 p.ct. at 120° C., 2s. 3d. to 2s. 5d. naked at makers' works; 50-90 p.ct. naked, North, 2s. 11d. to 3s. 1d. Toluol, naked, North, 3s. to 3s. 1½d. nominal. Coal tar crude naphtha in bulk, North, 11½d. to 1s. Solvent naphtha, naked, North, 2s. 3d. to 2s. 4d. Heavy naphtha, North, 2s. 9d. to 3s. Creosote, in bulk, North, liquid, 8½d. to 8⅝d.; salty, 8d. to 8¼d. Heavy oils, in bulk, North, 10½d. to 11½d. Carbolic acid, 60 p.ct., 1s. 8d. to 1s. 10d. Naphthalene, £20 to £30; salts, £7 to £9, bags included. Anthracene, "A" quality, 10d. to 1s. per minimum 40 p.ct.; "B" quality, nominal.

FROM A MARKET CORRESPONDENT.

Tar Products.

The market remains under the influence of the coal strike, and there is considerable irregularity. It is very difficult to obtain any reliable prices; but owing to the better demand for nearly all products, those last mentioned are practically near the mark. Pitch is said to have been sold at less than 60s., and probably this price may be taken as correct, since so few people want to do anything at all until they see what the markets are like after the coal dispute is settled. Heavy naphtha is somewhat scarce, but remains quiet at 2s. 3d. per gallon. Solvent naphtha is also in fair demand, although most consumers have postponed taking delivery of previous purchases. There is no further buying from the rubber manufacturing industry, the nominal price remaining at 2s. 4d. per gallon. Carbolic acid is dead; and those who have contracts running are unwilling to take delivery. Creosote is weak, and the price is quoted down to 7½d. per gallon. It is paradoxical that, in the absence of solid fuels, liquid fuels should be depressed. There is no better way of emphasizing the absolute lack of business and interest generally in the market. Naphthalene is still marked at £9 per ton for crudes and £20 per ton for refined. There is no change in cresylic acid, although there is a little more active demand. Intermediate products have been rather more satisfactory during the past



"BEARSCOT" TUBING IN WATER CONDENSERS EXTENDS UPWARDS OF 130 MILES.

WATER-COOLED CONDENSERS

AS FITTED WITH THE "BEARSCOT" SAFE JOINT TUBE.

With our Central Port Fourway Valve the Condensers may be Reversed or Bye-passed as Required.

Particulars will be supplied upon application to—

R. & J. DEMPSTER, LD.

Telegrams: "Scrubber Manchester"

MANCHESTER.

LONDON OFFICE:

34, VICTORIA STREET, WESTMINSTER, S.W.1.

few days. Prices are well maintained, and the undertone is quite healthy. Aniline oil and salt are in slightly better demand at last quoted rates. Salicylic acid is firm, and holders are looking for an early advance in price.

Sulphate of Ammonia.

There is nothing special to comment on in this section of the market. Business remains quiet, and interest is nominally centred on the prospects of lower quotations. For the present, however, such an event appears unlikely, as production will be greatly curtailed by the coal strike and the general dislocations which are accompanying it. The latest news from America shows that the supply of sulphate continues plentiful; and although some of the larger merchants are making strong efforts to keep prices up, stocks in second hands are being freely offered, and declines in prices have to be recorded. The larger producers in America claim that at the present prices it is not possible to sell sulphate at a profit. It is regarded as more probable, however, that costs of production will be reduced rather than that selling prices will be increased, unless a further substantial demand springs up in the near future.

Chelmsford and Belgian Gas-Pipes.—Alderman Taylor (the Chairman of the Gas Committee), in moving the acceptance by the Chelmsford Town Council of a Belgian tender for cast-iron gas-mains, said he was sorry to have to do so. The Belgian tender was £1435, whereas the lowest offer from British manufacturers was £2157. Mr. Harper pointed out that iron was produced more cheaply in Belgium than in Britain, because coal was cheaper there. Alderman Taylor's resolution was carried.

Glasgow Corporation Chemical Works.—Mr. W. A. Walmsley, Manager of the Glasgow Corporation Chemical Works, stated in an address to the Rotary Club, Glasgow, that the Corporation embarked upon the scheme about two years ago, when they took over the chemical plant at Dalmarnock; but since then the plant at all the gas-works had been acquired. The initial operations were confined to crude distillation; but the results were so successful that the chemical department were able to turn over to the gas department for each ton of coal carbonized 1s. 4d. more than the average price received from contractors. Fourteen months after the inception of the department, the whole of the residual products were being dealt with, amounting to 40,000 tons of tar, and the equivalent of 10,000 tons of sulphate of ammonia. By the end of September, they hoped to have at Provan one of the best-equipped chemical works in the country. The refining of the products was by far the most profitable side. The amount of money guaranteed for tar and ammoniacal liquors at the start of the current financial year was £360,000. This sum, which would be obtained despite the fact that the bottom had fallen clean out of these markets, was about £60,000 more than last year and £150,000 more than was received for the year 19·9.

Holiday Association at a Gas-Works.

A large party of members of the Bradford Branch of the Holiday Fellowship paid a visit last Saturday afternoon to the modern vertical retort plant at the Birkshall Gas-Works of the Bradford Corporation, under the leadership of Mr. J. W. Gill (Chairman of the Branch) and Mr. Harold F. Ogden (West Yorkshire representative of the "Journal"), who was the founder of the branch, and is the Hon. Organizing Secretary. The guides in the inspection of the plant were Mr. E. J. Sutcliffe (Deputy Gas Engineer), Mr. C. Roper (Mains Superintendent), and Mr. West. As a matter of fact, the visit had been arranged by the gentlemen concerned during a recent inspection of these works by the Yorkshire Junior Gas Association. The party were shown the entire plant, from the delivery and breaking of the coal, through the retort-house processes, to the coke-sorting, the condensing, scrubbing, washing, purifying, and measuring of the gas. The methods of extracting the various bye-products were also explained. At the conclusion of the visit, on gathering in the engine-house, Mr. Gill expressed the view that most members of the party had probably had a very great surprise that afternoon, in learning what a big variety of processes went on inside a gas-works, and what a large number of branches of the work existed. Mr. Ogden, proposing a vote of thanks to Mr. Charles Wood (the Gas Engineer) for permission to view the works, and to Messrs. Sutcliffe, Roper, and West, said the party had been over one of the most up-to-date plants in the North of England. He reminded the gathering that just now they had everything to thank the Gas Department for, both in respect of the good quality gas which was being delivered in the city, and for the fact that the entire supply of coal for household burning during the present crisis was being derived from the gas-works. They had to thank the foresight of the gas officials for being in possession, at this critical time, of stocks which were sufficient to meet the needs for the present.

Yeadon and the Therm Basis.—The Yeadon District Council have decided to protest against the Yeadon and Guiseley Gas Company's application for an Order empowering them to change the method of charging to the thermal unit. The Chairman said the public might not understand the proposal at present, but when they received their gas accounts they would, because the change would mean an increase per 1000 c.ft. over the present charges of 2s. 6d., and over the standard charge (3s.) of 3s. 4d.

Liverpool Lighting Engineer's Report.—In the reference to the annual report of Mr. A. G. Smith, the Liverpool City Lighting Engineer, which appeared on p. 102 of last week's issue, there was unfortunately a printer's error which, if left uncorrected, would be an injustice to the Gas Company. The statement was made "that tests of the gas at the various stations involved 112 visits, and on 110 occasions traces of sulphuretted hydrogen were revealed in the gas." Actually the number of visits paid was, as stated by Mr. Smith in his report, 1112.

WILLEY & CO., LTD.,

The Prepayment Meter with Long Range Price Adjustment

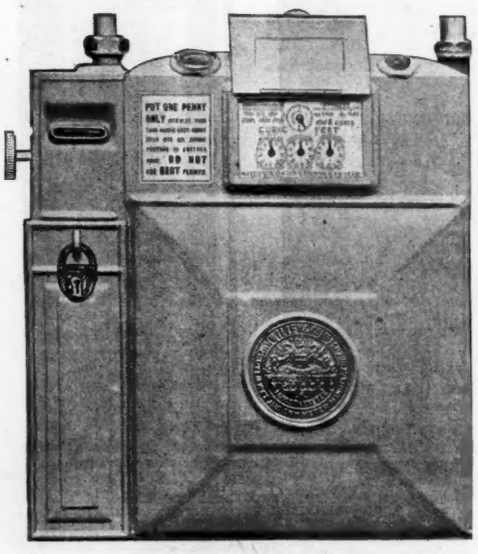
CHANGED *IN SITU.*

(1) No change Wheels required—simply move the pointer on Change Plate to any number from 5 to 43 cubic feet, or correspondingly for 1/- Automatic Meters.

(2) Mechanism secured with or without Seals.

(3) No Springs.

(4) A trial will assure you that you have Strength, Durability, and the last word in Simplicity and Low Maintenance costs.



Chief Office & Works.
EXETER.
Tele {gram - WILLEY EXETER. phones - 132 and 145.

LONDON Works.
89/95, Hertford Road, Kingsland, N.1.
Wire Gasvillado, Kinland, London.
Phone - Dalston 224.

MANCHESTER.
50, John Street, C. on M.
Wire - Wilmeter, Manchester.
Phone - 7419 City.

LEICESTER.
5, Oxendon Street.
Wire - - Meters, Leicester.
Phone - Leicester 4777.

Agents for SCOTLAND: D. M. NELSON & CO., 20, West Campbell Street, GLASGOW.

Brentford Gas Company's Order.

The Hammersmith Borough Council Law Committee report that a letter has been received from the Board of Trade stating that the Board have made an Order fixing a new standard price in respect of gas supplied by the Brentford Gas Company. The Company asked that the standard price should be fixed at 19d. per therm; and the price fixed by the Order is 17·45d. per therm. The Company have given notice that they intend to supply gas of a calorific value of 460 B.Th.U. per c.ft. as from April 1; and that as from the first reading of meters by the Company after this date, the charge for gas to ordinary consumers will be 14·6d. per therm—*i.e.*, 3·2d. less than the standard price. The price which the Company charged prior to March 31 last was 5s. 4d. per 1000 c.ft.; and the price which they will charge under the Order will be 5s. 7·16d., an increase of 3·16d. As regards dividends, the statutory dividends which the Company are entitled to pay on their "A" and "B" stock are 4 and 3½ p.ct. respectively. As the Company propose to sell gas at 3·2d. per therm below the standard price, they will be able to pay £4 6s. p.ct. on the "A" stock and £3 17s. 6d. p.ct. on the "B" stock. Consequently the Company are not in such a good position as regards dividends as in 1914, when they paid £5 10s. p.ct. on the "A" stock and £5 12s. p.ct. on the "B" stock.

Lurgan Gas-Works Extension Scheme.

At an inquiry held in Lurgan by Mr. A. D. Price, Engineering Inspector of the Local Government Board for Ireland, in regard to the Urban Council's application for a loan in connection with the extension of the gas-works, Mr. F. W. Pollock (the Town Clerk) said the Council's borrowing powers were £59,410 gross; but there were a certain number of loans charged against the gas-works, and other matters, which reduced the amount to £40,005. There were also outstanding liabilities against the gas-works, not affecting the borrowing powers, of £44,572. Mr. C. Johnston (the Town Solicitor) explained that the Council purchased the gas-works in 1915. At that time, an expert said they were in good order and working satisfactorily, and that there was a working margin of 10 to 15 p.ct. The increase of output had since then exceeded this percentage; and the Manager had reported that the plant had been working at its maximum for several years, and improvements totalling £28,000 would need to be carried out to keep pace with the requirements. On going into details, however, the Council were not anxious to expend so much money at present; and the Manager put forward the scheme now submitted, totalling £15,000. Mr. Wilfrid Tallentine (the Manager) said he had occupied his position for 21 years. In his opinion, it was absolutely necessary to have the retorts renewed. The output of gas had increased to 61⅜ millions in 1920 from 44½ millions in 1911. The Inspector intimated that he would report in due course.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official List" for April 20.]

Nos. 10,516 to 11,136.

Austin, O. H.—"Gas-burners." No. 10,543.
Barrow, P. E.—"Atmospheric gas-burner." No. 10,931.
Barrow, P. E.—"Gas heating-stove." No. 10,932.
Burnet, E.—"Vertical retorts for destructive distillation." No. 10,834.
Burton, A. E.—"Gas-retort mouthpieces." No. 11,134.
Chandler, D.—"Means for actuating gas and air valves, &c." No. 11,052.
Clapp, H. B.—"Gas-producers, crucible furnaces, &c." No. 11,065.
Clark, J. G.—"Bunsen burners." No. 11,059.
Clarke, C. E.—"Atmospheric gas-burner." No. 10,931.
Clarke, C. E.—"Gas heating-stove." No. 10,932.
Clarke, C. E.—"Gas cooking-stoves." No. 11,015.
Commin, F. J.—"Treatment of pitch." No. 11,060.
Cooke, J. J.—See Chandler. No. 11,052.
Dellwik, C.—"Conversion of heat into mechanical work." No. 10,582.
Ferolite, Ltd.—See Clapp. No. 11,065.
Galbraith, W. L.—See Clark. No. 11,059.
Hughes, A.—See Commin. No. 11,060.
Pease, E. L.—"Manufacture of compounds of ammonia, &c." No. 11,039.
Republic Flow Meters Company and Rogers, F. H.—"Flow-meters." No. 10,558.
Ryan, B.—"Thermostatic controllers for gas water-heaters." Nos. 10,658, 10,659.
Short, A.—"Self-regulating incandescent burner." No. 10,588.
Smith, E. W., and Smith Meters, Ltd.—"Coin-freed or prepayment gas-meters." No. 11,123.
South Metropolitan Gas Company.—See Chandler. No. 11,052.
Trent Process Corporation.—"Process of manufacturing combustible gas." No. 10,829.
Vincent, G.—See Barrow. Nos. 10,931, 10,932.
Wood, H.—"Gas-retorts." No. 11,041.

Application for Restoration of Lapsed Patent.

Notice is given that Frederick Henry Tweed has made application for the restoration of the patent granted to him for "Improvements in pipe connections" No. 16,722 of 1913, dated July 21.

It was reported at Darwen on the 22nd inst. that the gas undertaking had returned a loss of £4263, against a profit of £6030 last year.

"CANNON" Gas Cookers

The "COUNTY"

Still maintains its POPULARITY, OWING TO ITS MANY ADVANTAGES. . .

UP-TO-DATE IN CONSTRUCTION.

An Ideal Cooker for Hiring-Out Purposes.

CANNON IRON FOUNDRIES, LTD.,

DEEPFIELDS, Nr. Bilston, Staffs.

London Office and Show-Rooms:—

BATH HOUSE, 57-60, HOLBORN VIADUCT, E.C.

Australasian Agents: MOLDEN & BUDDEN PTY., Ltd., 364A, Little Collins Street, Melbourne, Vic.; and at SYDNEY, N.S.W.

New Edinburgh Gas Officials.—It was decided at the last meeting of the Edinburgh Gas Committee to ask the Town Council for powers to advertise for an Engineering Assistant to Mr. Harry H. Gracie (the new Engineer and Manager) at a salary of £500 per annum, and a Sales Superintendent at a salary of £350—this without bonus. The latter proposal involves the creation of a fresh post, and is intended to "popularize" the consumption of gas.

Staveley Gas Light and Coke Company.—The accounts of the Company for the year ended Dec. 31 show that the receipts amounted to £5233, which is an increase of £525 over the previous year. However, owing to the abnormal increase in the price of coal, wages, and materials generally, the Directors state that a loss of over £500 has been made; and they regret that, in the circumstances, it is impossible to recommend the payment of a dividend. After payment of debenture interest, and allowing for the loss on the year's working, the amount to carry forward is £730.

Price of Gas at Horsham.—In connection with a notification by the local Gas Company of an application to the Board of Trade for power to increase the price of gas from 6s. to 8s. 6d. per 1000 c.ft., the Clerk stated, at the last meeting of the Horsham Urban District Council, that the pre-war price was 4s. 2d. per 1000 c.ft. In 1915 it was raised to 4s. 7d., in 1918 to 5s., and in 1919 to 6s. The increase on the pre-war price at present was 44 p.ct. The profits made by the Gas Company in 1912-13-14 were £1901, £1264, and £1574 respectively; and during 1918-19-20, £283, £921, and £1381. To pay the dividend, £1171 was necessary. The Company anticipated a loss of £1228 on the trading for 1921, due to the increased price of coal, and various causes. In other towns, the average increase on pre-war charges for gas was 85 p.ct.; but the pre-war price of gas in their town was far in excess of that in most places. The Council decided to take steps to protest against the increase, and referred the matter to the Finance Committee for them to prepare a case.

STOCK MARKET REPORT.

THE Stock Exchange re-opened last week fairly well under the influence of the hopeful tone which marked the close of the week before, and there were some signs of a disposition to launch-out a little and quicken business up. Most markets showed an improving tendency. This attitude held good for the next day; but it did not extend. Thenceforward business began to shrink, and the general feeling was not so buoyant; but no marked fall took place. In the gilt-edged market, Home Government did well on the whole, more especially War Loan. Friday's figures for the big four were: Consols 48⅜-48¾, War Loan 88 11/16-88 15/16, Funding 70⅝-71, Victory 77⅞-78. Bonds were very firm, and corporations fairly so. The new Indian Loan was a great success. Home Rails, after a good start, fell back.

The Foreign Market made several advances, but did not close at top prices. Brazilian, Chilian, Chinese, and Japanese were well to the front; and there was some inquiry for Russian. Argentines were dull.

In the Miscellaneous Market, Oils and some Industrials rose; but Rubber was dull.

Business in the Gas Market quite recovered in point of activity. The volume of transactions was up to average, and the general tone was firmer. In the London companies, Gas Light preference and debenture, and Commercial 4 p.ct. rose 1 each. South Metropolitan was very steady. In Suburban and Provincial, Alliance and Dublin and Newcastle were higher. In Continentals, European touched higher figures; but Imperial weakened by changing hands at 150. Primitiva preference rose 1/16.

Bargains done for cash during the week were as follows: On Monday, European 7⅛, 7¼, Gas Light Ordinary 51⅜, 52, 52⅜, Imperial Continental 153, 155, Primitiva 9s. 6d., 10s., ditto preference 26s. 6d., 27s. 6d., South Metropolitan 63½, South Suburban 56¼, Tottenham "B" 53, Barnet District "B" 87, ditto "D" 67. On Tuesday, Commercial 4 p.ct. 49, 51½, ditto 3½ p.ct. 46, European 7⅛, Gas Light ordinary 51½, 52⅜, 53, ditto maximum 43, ditto preference 57, Imperial Continental 153½, 154, ditto debenture 77½, 78, Primitiva 10s., ditto preference 26s. 6d., South Metropolitan 62½, 63½, 63¾, South Suburban 57½, Hornsey 10 p.ct. "A" 96. On Wednesday, Commercial 4 p.ct. 52, Gas Light ordinary 52¼, 52½, 53, ditto maximum 42½, 43, ditto preference 57, ditto debenture 47, 49½, Imperial Continental 153, Primitiva 9s. 9d., ditto preference 26s. 6d., 28s. 1½d., South Metropolitan 63, 63½, ditto debenture 46½, South Suburban 56½, ditto debenture 66½, 67½, Tottenham "A" 59½. On Thursday, Alliance and Dublin 41½, 42½, Bombay 4 1/16, Gas Light ordinary 52⅞, Imperial Continental 150, 152, 153, 154½, 155, Primitiva preference 28s. 6d., South Suburban 57½, ditto debenture 67½, Tottenham debenture 53. On Friday, Gas Light ordinary 52¼, 52⅜, 52⅝, 52⅞, 53, ditto maximum 42, 43, ditto preference 57, ditto debenture 48, Imperial Continental 150, 151, 151½, 152, 152½, 153, Lea Bridge 60, Primitiva preference 28s. 3d., 28s. 6d., South Suburban debenture 68¼, Wandsworth "C" 53.

In the Money Market, there was a strong demand which intensified daily, so that on Thursday rates had stiffened materially, when a large supply came to the rescue. Terms for discount kept step. Silver fluctuated moderately from day to day. The Bank rate remains at 7 p.ct., as fixed on April 17, 1920.

The Paisley Town Council have accepted the tender of the Woodall-Duckham Company for an installation of vertical retorts, at a cost of £87,000.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Mar. 11	4	4%	Aldershot 4 p.c. Pref.	...	53—58	...
1,551,868	,,	Apl. 14	2½	3⅛%	Alliance & Dublin Ord.	59—64	39—44*	41½—42½
374,000	,,	Jan. 13	4	4%	Do. 4 p.c. Deb.	76—79	47—52	...
280,000	5	Oct. 28	7½	8%	Bombay, Ltd.	5½—6½	4—4½	4 1/16
100,000	5	Feb. 25	16	5%	Bourne-mouth Gas and Water { 5 p.c.	...	7—8	...
383,110	10	,,	7	7%	Bourne-mouth Gas and Water { B 7 p.c.	15—15½	8½—9½	...
115,000	10	,,	6	6/-	Bourne-mouth Gas and Water { Pref. 6 p.c.	13½—14	7½—8½	...
162,065	—	Dec. 30	—	4%	Bourne-mouth Gas and Water { 4 p.c. Deb.	...	55—60	...
992,045	Stk.	Feb. 25	14	30/-	Brentford A Consolid.	261—266	50—55	...
734,920	,,	,,	11	26/3	Do. B New	204—209	47—52	...
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	68—73	...
221,400	,,	Dec. 15	4	4%	Do. 4 p.c. Deb.	91—93	57—59	...
214,775	,,	Mar. 11	11	7½%	Brighton & Hove Orig.	208—213	95—105	...
244,200	,,	,,	8	5½%	Do. A Ord. Stk.	154—159	65—75	...
1,287,500	Stk.	July 29	5	5%	Bristol 5 p.c. max.	...	...	...
530,000	20	Mar. 30	12½	10%	British	...	...	...
120,000	Stk.	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	44—45	21—23	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	88—90	50—55	...
100,000	10	May 27	—	—	Cape Town & Dis., Ltd.	85—87	37—40	...
100,000	10	Dec. 10	—	4½%	Do. 4½ p.c. Pref.	1½—2½	7—7½	...
100,000	Stk.	Dec. 30	4½	4½%	Do. 4½ p.c. Deb. Stk.	4—6	3—6	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	70—75	55—60	...
1,513,280	,,	Feb. 25	5/9/4	30/-	Commercial 4 p.c. Stk.	108—110	...	...
560,000	,,	,,	5½	26/3	Do. 3½ p.c. do.	106—108	48—53	49—52
475,000	,,	Dec. 15	3	3%	Do. 3 p.c. Deb. Stk.	103—105	45—50	46
800,000	,,	Dec. 11	4	—	Continental Union Ltd.	69½—71½	42—45	...
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	76—79	20—25	...
51,600	,,	Feb. 5	15	10%	Croydon A 10 p.c.	115—118	30—40	...
278,400	—	,,	12	7%	Croydon B and C 7 p.c.	...	120—130	...
492,270	Stk.	—	6	4½%	Derby Con. Stk.	123—125	95—105	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	...	...
1,002,180	10	Jan. 29	10	5/0	European, Ltd.	17½—18	6½—7½	7½—7½
16,298,975	Stk.	Feb. 10	4/17/4	30/-	Gas Light and Coke { 4 p.c. Ord.	98—102	51—54	51½—53
2,600,000	,,	,,	3½	26/3	Gas Light and Coke { 3½ p.c. max.	76—79	41—44	42—43
4,062,235	,,	,,	4	4%	Gas Light and Coke { 4 p.c. Con. Pref.	96—99	56—59	57
4,674,850	,,	Dec. 15	3	3%	Gas Light and Coke { 3 p.c. Con. Deb.	72½—74½	47—50	47—49½
130,000	,,	Dec. 11	10	10%	Gas Light and Coke { 10 p.c. Bonds.	...	...	...
82,500	,,	Mar. 11	5	3½%	Hastings & St. L. 5 p.c.	...	48—53	...
258,740	,,	,,	3½	2½%	Do. 3½ p.c.	87—89	34—39	...
70,000	10	May 13	11	8%	Hongkong & China, Ltd.	16½—16¾	8¼—9¼	...
86,600	Stk.	Mar. 11	9	5½%	Hornsey 7 p.c.	...	75—85	...
131,000	,,	Mar. 30	7½	3½%	Ilford A and C	151—154	75—79	...
65,780	,,	,,	6½	2½%	Do. B	115—118	55—60	...
65,500	,,	Dec. 30	4	4%	Do. 4 p.c. Deb.	92—94	54—56	...
1,976,000	,,	,,	9	5% †	Imperial Continental	150—160	150—155	150—155
1,235,000	,,	Feb. 10	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	75—80	77½—78
235,242	,,	Mar. 30	6½	3½%	Lea Bridge Ord. 5 p.c.	119—121	58—63	60
2,498,903	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord. { A.	211—213	...	...
					Liverpool 5 p.c. Ord. { B.	146—148	...	...
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	...	...	...
163,736	,,	Feb. 25	7/5/6	3½%	Maidstone 5 p.c.	...	52—57	...
75,000	5	June 11	6	3%	Malta & Mediterranean	4¼—4½	1½—2½	...
250,000	100	Apl. 1	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99—101	88—93	...
341,920	Stk.	Nov. 26	4	6%	Monte Video, Ltd.	11½—12	60—70	...
1,875,892	,,	Feb. 25	4½	3½%	Newcastle & Gatsh'dCon.	98½—99½	55—57	...
529,705	,,	Dec. 30	3½	3½%	Do. 3½ p.c. Deb.	82—83	50—51	...
15,000	10	Mar. 11	—	8%	North Middlesex 10 p.c.	...	12½—13	...
55,940	10	,,	7/14/0	5½%	,, ,, 7 p.c.	14—15	7—7½	...
300,000	Stk.	Nov. 26	8	8%	Oriental, Ltd.	117—122	85—90	...
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7¾	2—3	...
60,000	50	Feb. 25	13	7½%	Portsea Island, B	128—131	65—70	...
100,000	50	,,	12	6½%	Do. C	118—121	50—55	...
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	1—1½	9/6—10/-
499,960	5	June 26	5	—	Do. 5 p.c. Pref.	4½—5	1½—2½	26/6—28/6
321,600	100	Dec. 1	4	4%	Do. 4 p.c. Deb.	91—93	67—69	...
600,000	Stk.	Jan. 27	4	4%	Do. ,, ,, 1911	...	37—40	...
346,198	,,	Dec. 30	4	4%	River Plate 4 p.c. Deb.	85—87	37—40	...
150,000	10	Mar. 30	6	6/-	San Paulo { 6 p.c. Pref.	10½—11	6—7	...
125,000	50	Jan. 3	5	5%	San Paulo { 5 p.c. Deb.	47—49	37—39	...
135,000	Stk.	Mar. 30	10	5%	Sheffield A	223—224	62—64	...
209,984	,,	,,	10	4½%	Do. B	222—224	62—64	...
523,500	,,	,,	10	3½%	Do. C	220—222	60—62	...
133,201	Stk.	Sept. 15	4	4%	Shrewsbury 5 p.c.	...	...	...
90,080	10	Sept. 30	9	9%	South African	10½—11½	10½—11½	...
6,609,895	Stk.	Feb. 10	5/4/0	5%	South Met. Ord.	111—113	62—65	62½—63½
250,000	,,	Jan. 13	—	5%	Do. Red. Pref.	...	90—92	...
1,895,445	,,	,,	3	3%	Do. 3 p.c. Deb.	72½—74½	45—48	46½
224,820	,,	Feb. 25	8½	7½%	South Shields Con. Stk.	157—159	86—88	...
1,087,795	,,	,,	6	3½%	S'th Suburb'n Ord. 5 p.c.	114—116	56—61	56½—57½
247,558	,,	Dec. 30	5	5%	Do. 5 p.c. Deb. Stk.	116—118	65—70	66½—68½
647,740	,,	Nov. 12	7½	3½%	Southampton Ord.	99—102	55—58	...
121,275	,,	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	...	57—59	...
120,000	,,	Feb. 25	—	3½%	Tottenham { A 5 p.c.	135—138	57—62	59½
782,275	,,	,,	6	2½%	Tottenham { B 3½ p.c.	115—117	50—55	53
181,255	,,	Dec. 15	4	4%	Tottenham { 4 p.c. Deb.	87—89	53—56	53
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	...
236,476	Stk.	Feb. 25	5	3½%	Tynemouth 5 p.c. max.	108½—109	68—70	...
30,000	,,	Feb. 25	8½	47/6	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	151—156	75—80	...
255,636	,,	,,	6½	32/6	Do. B 3½ p.c.	129—134	53—58	...
108,075	,,	,,	—	33/3	Do. C	...	50—55	...
140,865	,,	,,	—	33/3	New Ordinary	...	50—55	...
352,000	,,	,,	6½	26/3	Wimbledon 5 p.c.	117—122	43—48	...
98,000	,,	,,	6½	32/6	Epsom 5 p.c.	121—126	50—55	...
88,416	,,	Dec. 30	3	3%	3 p.c. Deb. Stk.	66—69	40—45	...

* Ex Div. † Next dividend will be at this rate.

Omagh Gas Undertaking.—At a meeting of the Omagh Urban District Council, a letter was read from the Local Government Board for Ireland, stating that, as the result of an inquiry held recently, it had been agreed to sanction the raising of £3000 by way of an overdraft, for a period of five years, to provide sufficient working capital to carry on the gas-works.

Whooping Cough Treatment at a Gas-Works.—There has been an epidemic of whooping cough in Great Falls (Mont.); and for the purpose of affording treatment to sufferers, Mr. W. A. Bertke, the gas manager, had benches installed in the purifier-house, where the "oxide cure" could be taken by children while they played, through the simple process of inhaling the fumes from the "oxide," which is composed of ordinary shavings, iron borings, and lime. The "oxide," having collected the impurities from the gas, is taken from the purifiers and scattered upon the floor; and it is there that the children are allowed to play in it for one or two hours. On the first day, the spasms are said to be noticeably shortened; and usually after the fifth or sixth day they have ceased entirely. The general coughing wears away gradually after this.

The Sulphate of Ammonia Market.—The Southend Corporation Gas Committee have had communications from the contractors for the purchase of the ammoniacal liquor produced at the Leigh-on-Sea Gas-Works, pointing out the very unsatisfactory state of the market for sulphate of ammonia. From them it appeared that the amount to be paid by the firm under their contract for the ammoniacal liquor (which is based upon a sliding-scale according to the price being obtained for the sulphate of ammonia) had fallen to *nil*. The Company further pointed out that since December last they would not receive even the cost of the manufacture of the sulphate of ammonia, without charging anything to the value of the gas liquor; that if they are to continue to work-up the gas liquor, the gas undertaking must meet them in their loss, and that they are prepared, as long as they are assured of the bare cost of manufacture, without allowing any charge for repairs, depreciation, or interest on capital, to continue to work-up the ammoniacal liquor until the end of May. It was resolved that the firm be asked to submit particulars of the assistance they require from the gas undertaking.

Wellington (N.Z.) Gas Company, Ltd.—At the fifty-first annual meeting of the Company, the report and balance-sheet for the year 1920 were adopted without discussion, and a further dividend of 5½ p.ct. for the six months ended Dec. 31 was approved. The profits for the year amounted to £45,449. Dr. C. P. Knight, in the chair, made reference to the difficulties in obtaining all materials, especially coal, and to the recurrent labour troubles. As a result of the latter, the plant at Miramar had on one occasion been forced to close-down for a number of days. The cost of gas making had necessitated two advances in the price of the commodity—the figure now standing at 8s. 9d. per 1000 c.ft. This was insufficient to balance the increased cost of production; but the enhanced value of residuals had made them ample compensation. New capital would be required for present and future extensions of the plant. The Chairman's speech closed with a reference to the retirement of Mr. Helliwell (the Secretary since 1905), who had been in the employment of the Company for 37 years. He was accorded the thanks of the proprietors and due recognition of his faithful service.

As the result of last year's working, a net profit of £2100 was made by the Nelson Corporation Gas Department. For the previous year, the net profit was £3044.

The Directors of the Oriental Gas Company, Ltd., have resolved to pay, on the 31st of May, an interim dividend at the usual rate of 3½ p.ct., less income tax, on account of the year ending June 30.

The Southend Corporation Gas Committee report that a letter has been submitted from the Hon. Secretary of the Southend Branch of the Independent Labour Party urging the necessity for the provision of a municipal gas supply; but the Committee do not recommend any action thereon.

Mr. C. A. Kendrick, who for many years has represented the Welsbach Light Company, Ltd., in the Midlands and North of England, has recently undergone a very serious operation. His many friends will be glad to know that he has passed the critical stage, and is now making satisfactory progress; but it will probably be two or three months before he is about again.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer—not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON TUESDAY, to ensure insertion in the following day's issue.

Orders to Alter or Stop PERMANENT ADVERTISEMENTS should be received by the FIRST POST on Monday.

UNDISPLAYED ADVERTISEMENTS: Situations Wanted, Six Lines and under (about 36 words) 3s.; each additional Line, 6d. Situations Vacant, Apparatus Wanted and for Sale, Contracts, Public Notices, &c., 9d. per Line—minimum, 4s. 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

		ONE YEAR.	HALF-YEAR.	QUARTER
United Kingdom	Advance Rate:	35/-	18/-	10/-
	Credit Rate:	40/-	21/-	11/6
Abroad (in the Postal Union) Payable in Advance		40/-	22/6	12/6

In payment of subscriptions for "JOURNALS" sent abroad, Post Office Orders or Bankers' Drafts on London only are accepted.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C. 4.

Telegrams: "GASKING, FLEET LONDON." Telephone: Holborn 6857.

OXIDE OF IRON

FOR SALE OUTRIGHT, OR ON LOAN.

SPENT OXIDE

PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LTD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.2.

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for Gas-Works.
ANDREW STEPHENSON, Gresham House, Old Broad Street, LONDON, E.C. "Volcanism, London."

BRITISH LUX.
AN EXCELLENT PURIFYING MATERIAL.
Features;—
(a) Porosity equal to Best Bog Ore.
(b) Contains Ferric Hydrate in an active state, thus resembling "Lux."
(c) Prepared in good mechanical condition ready for Purifiers.
DANIEL MACFIE, 1, NORTH ST. ANDREW STREET, EDINBURGH.

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER WORK in connection with Sulphate Plants.
We Guarantee promptness with efficiency for Repairs.
JOSEPH TAYLOR (SATURATORS), LTD., Chemical Plant Engineers, Blackhorse Street Mills, BOLTON.
Telegrams—"SATURATORS, BOLTON." Telephone 848.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E. 1.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams—
"BRADDOCK, OLDHAM," and "METRIQUE, LAMB, LONDON."

TULLY GAS PLANTS, LTD.,
SOLE MANUFACTURERS OF
TULLY'S Patent Carburetted Hydrogen PLANT.
MILLGATE, NEWARK-ON-TRENT.

BRITISH GAS PURIFYING MATERIAL.
ENGLISH BOG ORE AND NATURAL HYDRATED OXIDE OF IRON,
SPENT OXIDE BOUGHT.
BRITISH GAS PURIFYING MATERIALS CO., LTD.
(W. T. P. CUNNINGHAM, Proprietor.)
13, ARCADIAN GARDENS, WOOD GREEN, LONDON, N. 22.
Telegrams: "Bripurimat, Wood, London."
'Phone: Palmers Green 608.

INVENTIONS PATENTED. TRADE MARKS REGISTERED.
Advice and Handbook free. 35 years' references. Gas Patents a Speciality. KING'S PATENT AGENCY, Ltd. (Director, B. T. King, A.I.M.E., British and U.S. Regd. Patent Agent), 146A, QUEEN VICTORIA STREET, LONDON, E.C. 4.

OXIDE OF IRON.
SPENT OXIDE BOUGHT.
BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C.3.
Phone: Avenue 6680.

"TORTO" FIRE CEMENT.
BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C.3.
Phone: Avenue 6680.

"KLEENOFF," THE COOKER CLEANSER
Tins for Sale to Consumers.
In Bulk for Works Use.
BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C.3.
Phone: Avenue 6680.

SULPHURIC ACID.
SPECIALLY prepared for the manufacture of SULPHATE OF AMMONIA.
SPENSER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD.; Mark Lane, LONDON, E.C. Works—SILVERTOWN
Telegrams—"HYDROCHLORIC, FEN, LONDON."
Telephone—1588 AVENUE (3 lines).

JOHN RILEY & SONS, Limited, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 60 years. Reference given to Gas Companies.

ROBERT DEMPSTER & SONS, Ltd., Elland, Gas Engineers and Contractors for CARBONIZING PLANTS on Horizontal or Vertical Principles, and Stoking Machinery. HANDLING INSTALLATIONS, including Coal Breaking, Elevating, Conveying Plants and Coke Screening, Storing and Telpherage Plants. PURIFICATION.—All Branches of Wet and Dry Purification. STORAGE.—Gasholders, and all forms of Gas Apparatus. Wire: "Dempster, Elland." 'Phones: Elland 261, 262, 268.

FIRTH BLAKELEY, SONS, & CO., LIMITED, 15, Park Row, Leeds. GAS-WORKS EXTENSIONS. When requiring Alterations or Additions to your Plant, please communicate with us before placing your orders. Gas Apparatus, Coke-Oven Plant, and Structural Steel Work our Specialities. Satisfaction guaranteed. Phone, 22,579 Leeds.

MEWBURN, ELLIS, & CO.,

CHARTERED PATENT AGENTS AND TRADE MARK AGENTS,
70 & 72, Chancery Lane, London, W.C. 2.
Telegrams: "Patent, London." Phone 248 Holborn.
And 3, St. Nicholas Buildings, Newcastle-on-Tyne.

SPENCER'S Patent Inclined HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, Feb. 23, p. 498.

TAR WANTED.

BEFORE entering into any arrangement for the DISPOSAL of your Production, it will be to your interest to communicate with
BROWNHILLS CHEMICAL WORKS CO.,
near WALSALL.

HUTCHINSON BROTHERS, Ltd.
Falcon Works, Barnsley.
Manufacturers of
GAS METERS (Ordinary and Slot),
"FALCON" INVERTED LAMPS,
SQUARE STREET LANTERNS
SUPERHEATER BURNERS, and
CONVERSION SETS for Street Lanterns.

ENQUIRIES SOLICITED.

FOR Gas Works Plant of Every Description; also SULPHATE OF AMMONIA and SULPHUR RECOVERY PLANTS.
C. & W. WALKER, LIMITED,
DONNINGTON, NEWPORT, SALOP.

GEORGE WILSON GAS METERS, Ltd. for
GAS-METERS, ORDINARIES, SLOTS, AND REPAIRS,
Foleshill Road, Coventry.
Telephone: 596. Telegrams: "Gasmeter,"
and at 7/9, Grosvenor Street, C.onM., Manchester.
Telephone: 3214 City. Telegrams: "Gasmeter."
and 46 & 47, Auckland Street, London, S.E. 11.

J. E. C. LORD (Manchester), Ltd., Ship Canal Tar Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

NATIONAL ASSOCIATION OF TECHNICAL GAS OFFICIALS.

Head Office:—Temple Courts,
55, Temple Row,
BIRMINGHAM.

Full particulars for membership, &c., can be obtained from the General Secretary.

APPOINTMENTS, &c., VACANT.

WANTED—Manager for Works in South. Make 100 Millions. Thorough knowledge of Modern Methods of Gas Manufacture and Distribution, including Water Gas.
Apply, by letter, stating Age, Experience, and Salary required, to No. 7040, care of Mr. King, 11, Bolt Court, Fleet Street, E.C. 4.

PLANT, &c., FOR SALE & WANTED.

GAS ENGINEERS AND MANAGERS.

LIST of Modern Gas Plant just issued. Copy willingly sent on application.
This comprises Retort Mountings, Condensers, Washers, Scrubbers, Purifiers, Gasholders, Exhausters, and Sundries. Complete Installations, Renewals, and Extensions.
It will pay you to ask us to quote.
Firth Blakeley, Sons, and Co., Ltd., Church Fenton, *via* Leeds.

FOR SALE—Disused Belt Driven Donkin-Beale GAS EXHAUSTER in Good Condition. Pass 7000 to 30,000 c.ft. per hour; also 600 Light Wet METER (Milne), Without Float.
Bridlington Gas Company, Gas-Works, Bridlington.

WATFORD GAS-WORKS.

WANTED, in thorough working order, Second-Hand 5-Ton LOCO STEAM CRANE, length of jib 40 ft. to 45 ft.; also GRAB (capacity 15 cwt. for Coal).
Full Particulars to No. 7039, care of Mr. King, 11, Bolt Court, Fleet Street, E.C. 4.

THOS. DUXBURY & Co.
16, Deansgate, Manchester.
Specialists in Gas Coal and Cannel.
COKE MERCHANTS.
Telegrams: "Darwinian, Manchester." Telephone: 3268 and 3269 City

JOHN J.
GRIFFIN
& SONS, LTD.,
KEMBLE ST.,
KINGSWAY, LONDON, W.C.
MAKERS OF ALL THE
"BOYS" GAS CALORIMETERS
which have been in daily use in all the Official Testing Stations in London since the calorimetric test was introduced in 1906.
PYROMETERS AND **THERMOMETERS** FOR
TECHNICAL & INDUSTRIAL PURPOSES.

STOCK BOILERS.

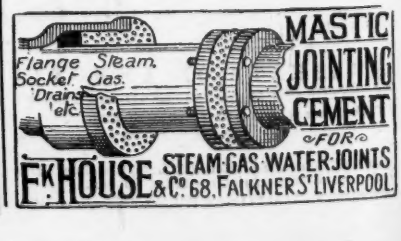
MOST MODERN "DISH END" TYPE.
WITH CORRUGATED SECTIONS.

One	30 ft. 0 in. × 9 ft. 3 in.	× 150 lbs. W.P.
Two	30 ft. 0 in. × 9 ft. 3 in.	× 160 lbs. W.P.
One	30 ft. 0 in. × 9 ft. 3 in.	× 120 lbs. W.P.
One	30 ft. 0 in. × 8 ft. 6 in.	× 160 lbs. W.P.
One	30 ft. 0 in. × 8 ft. 3 in.	× 175 lbs. W.P.
Two	30 ft. 0 in. × 8 ft. 3 in.	× 160 lbs. W.P.
Two	30 ft. 0 in. × 8 ft. 3 in.	× 120 lbs. W.P.
Four	30 ft. 0 in. × 8 ft. 3 in.	× 100 lbs. W.P.
One	28 ft. 0 in. × 7 ft. 6 in.	× 160 lbs. W.P.
Two	28 ft. 0 in. × 7 ft. 6 in.	× 130 lbs. W.P.
Five	28 ft. 0 in. × 7 ft. 6 in.	× 120 lbs. W.P.
Four	28 ft. 0 in. × 7 ft. 3 in.	× 160 lbs. W.P.
Eight	24 ft. 0 in. × 7 ft. 3 in.	× 120 lbs. W.P.
Two	28 ft. 0 in. × 7 ft. 3 in.	× 120 lbs. W.P.
One	24 ft. 0 in. × 6 ft. 6 in.	× 120 lbs. W.P.
One	23 ft. 6 in. × 7 ft. 3 in.	× 160 lbs. W.P.

Also other sizes and Pressures Ready for Immediate Despatch.
REPAIRS TO ALL TYPES OF BOILERS BY FIRST-CLASS MEN.
John Thompson (Wolverhampton), **Ltd.**
ETTINGSHALL, WOLVERHAMPTON, Eng

TROTTER, HAINES, & CORBETT, LIMITED.
BRETTELL'S ESTATE,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.
Manufacturers of GAS RETORTS, GLASSHOUSE FURNACE & BLAST FURNACE BRICKS, LUMPS, TILES, and every Description of FIRE BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
Shipments Promptly and Carefully Executed.
London Office: E. C. Brown & Co., Leadenhall Chambers, 4, St. Mary Axe, E.C.

KOPPER'S PATENT
CHAMBER OVENS.
Results obtained which have never been Surpassed by any other System of Carbonization.
Plants at Work and under Construction for the production of **70,000,000** cubic feet of Gas per Day.
See our large advertisement appearing in alternate issues of the "JOURNAL."
The KOPPERS'
COKE OVEN AND BYE-PRODUCT CO.,
301, Glossop Road, SHEFFIELD.

KENYON'S PATENT **OIL FILTER** and **WATER SEPARATOR**
Over **900** ordered by H. M. Government.
ENGINEERS' STORES, TOOLS.
ALEXANDER KENYON & CO., LTD.,
Victoria Bridge, MANCHESTER.

NOTE NOTE
NEW ADDRESS
TELEPHOS LTD.,
VAUGHAN ROAD,
HARROW, N.W.
Telephone: HARROW 777. Telegrams: "PILOTLESS, HARROW."
TELEPHOS GAS SWITCH AND **BROADBERRY STREET LAMP CONTROLLER.**
Ask for Particulars and Prices.